AVIATION

The Oldest American Aeronautical Magazine

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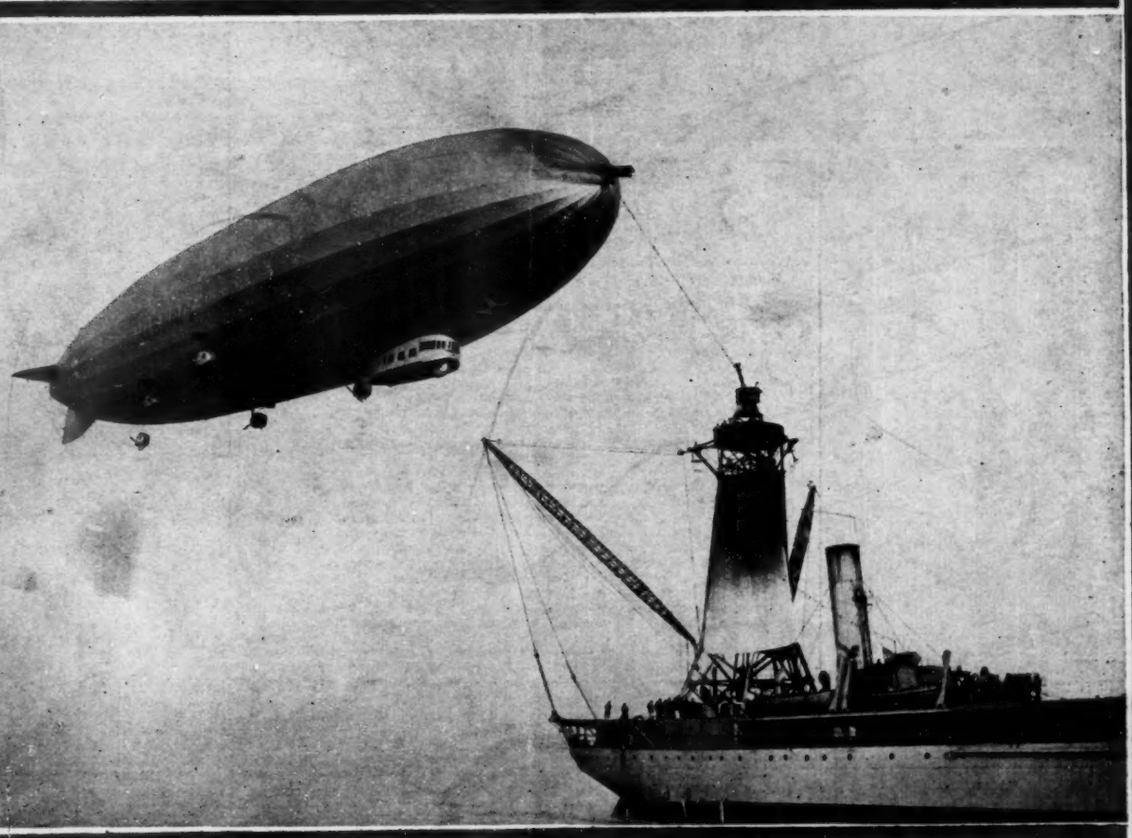

The Los Angeles being hauled to the mast of the U.S.S. Patoka, in first sea mooring test

VOLUME XVIII

NUMBER 4

SPECIAL FEATURES

ELECTRIC DYNAMOMETERS IN ENGINE DEVELOPMENT

PRIVATELY OWNED AND OPERATED AIR TERMINALS

EXPENDITURES OF GOVERNMENT WITH AIRCRAFT INDUSTRY

GARDNER PUBLISHING CO., Inc.
HIGHLAND, N. Y.
225 FOURTH AVENUE, NEW YORK

Entered as Second-Class Matter, Nov. 22, 1920, at the Post Office at Highland, N. Y. under Act of March 3, 1879.

Curtiss Reed Duralumin Propeller used on U. S. Pursuit Planes

FAIRCHILD FLYING CORPORATION

DIVISION OF FAIRCHILD AERIAL CAMERA CORP.

CABLE ADDRESS "FAIRCAM"
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NEW YORK CITY

January 5, 1925.

Curtiss Airplane & Motor Co., Inc.,
Metal Propeller Department,
Garden City,
L.I., N.Y.

Attention: Mr. C. S. Jones.

Gentlemen:-

As one of the civilian aviation companies using the Curtiss-Reed Metal Propeller, we felt that you might be interested to have a report on how this propeller is working out for us.

Last September we purchased from you for our Canadian Company - Fairchild Aerial Surveys Company (of Canada) Ltd. - one of these propellers for use on our Huff Daland machines. The requirements for a propeller in this work are rather severe inasmuch as this machine is operated as a seaplane all summer, subjecting the propeller to the usual spray conditions encountered with seaplanes, and as a land plane flying with wheels or skiis in the winter time. During much of the summer season the machine is away from its base and, therefore, moored out in the open without protection. Furthermore, in Quebec the temperature differences between winter and summer are very severe.

It was only after very careful flight tests made by the writer personally that the order was placed with you for this Curtiss-Reed Propeller, and we are very pleased indeed to inform you that the results obtained with it have exceeded the guaranteed performance. A great improvement has been effected in the climb of the machine when carrying the heavy loads which are used in Canada, and whereas the wooden propeller formerly used caused excessive vibration in the machine, the Curtiss-Reed Metal Propeller has been found to be remarkably smooth. The results have been so good that our Canadian Pilot, Mr. Kenneth F. Saunders, describes them as wonderful.

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We are so well pleased with the results obtained that we are placing with you an order for one more of these propellers to be used on our Huff Daland machine which we are flying here.

Yours very truly,

Richard H. Depew Jr

Richard H. Depew, Jr.,
Vice President.

The Curtiss-Reed Duralumin Propeller will give YOU similar results

Our new prices will interest you

CURTISS AEROPLANE & MOTOR COMPANY, Inc.

Metal Propeller Department

Garden City, N. Y.

JANUARY 26, 1925

AVIATION

VOL. XVIII. NO. 4

Published every Monday

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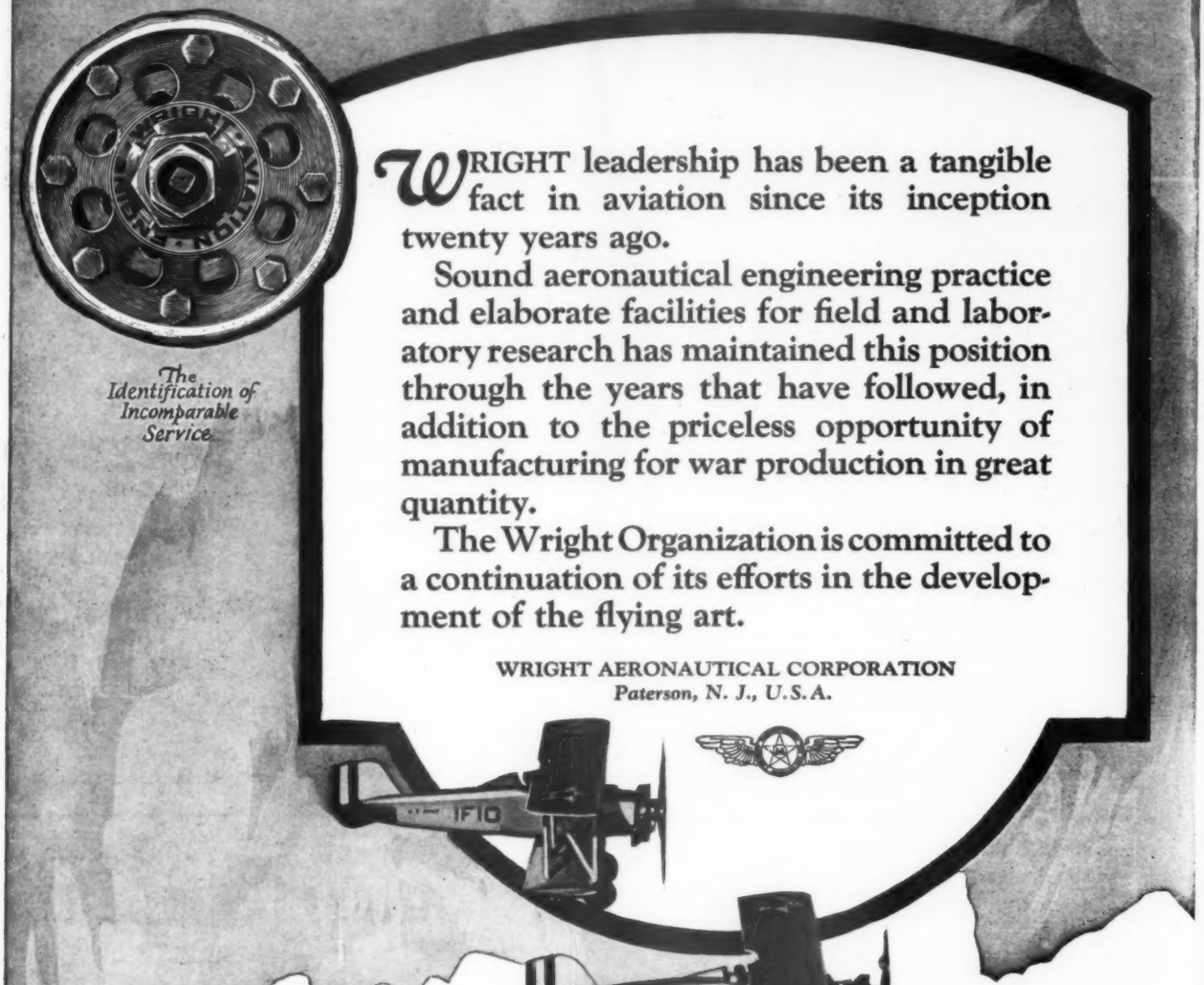

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VOL. XVIII JANUARY 26, 1925 No. 4

Aircraft Regulations and the Public

WITH regard to aeronautical legislation it is not so much a question of whether or not we shall have regulations governing aircraft, but rather a question of when and what kind of regulations we shall have. Aviators are rather apt to forget that the public has something to say in this matter, too. When planes get more common, as they will within a few years, the public will demand some method of identifying low flying planes which endanger the lives of those on the ground.

The question then comes down to how and when. There are two schools: one advocating state regulation, and the other federal regulation. The advocates of state regulation feel that it would be more flexible and less autocratic than federal control, that it would fit local conditions and that if politics should influence its enforcement, they would have a chance to get in on it. However, we believe that the confusion resulting from state regulation would more than overbalance the possible advantages. The planes of the future will fly from one country to another as easily as an automobile travels from one state to another. If every state has its own laws and regulations, and some enforce them and some don't, it will certainly make things more difficult for the flier.

Commercial aviation seems to have got along fairly well so far without any legislation and there seems to be no desperate hurry about rushing a bill through Congress, but all the time more and more states and communities are passing air laws and ordinances, and public opinion is growing more insistent that some kind of legislation be passed. It will be seen from an analysis of aircraft legislation that there are no fixed regulations laid down as to the method of licensing or inspection. All this will have to be worked out slowly rather than rushed. A law, if passed now, should be general in its terms and the details could be worked out gradually. This would be better than having a drastic law thrust upon aviation at a later date. Legislation which attempted by the completeness of its regulations to make aviation absolutely safe could only succeed if it kept all airplanes on the ground. All that is needed at the present time is to give aviation a legal status to allow of the registration and identification of planes and the licensing of pilots. The interpretation of the law, especially at the beginning, should be fairly liberal and regulations should be framed with a view to encouraging flying rather than to making it absolutely safe. The law should be held as a club over fliers whose machines are habitually in bad need of repair, but as a rule the club should be used with discretion.

If regulatory legislation were passed and reasonable regulations are adopted, it could be a real help to the fliers, for the mere passing of a law should give the public greater confidence in air transport. First, the public would feel that it was being protected from irresponsible and incompletely trained pilots. Second, it would be satisfied that the pilots had had a physical examination and were fit to fly. And third, it would know that the machines in use were structurally sound and well kept up. All this would increase confidence and help the aviation business. There would be less prejudice to flying in new types of machines if these had passed a structural test. Even capital might become a little less timid about entering into air transport if legislation were passed and aviation legalized.

Lord Thomson

AN ex-Air Minister is a rare person, indeed. Even in Great Britain, where a separate Air Department has been in existence since the spring of 1918, there exists only a handful of ex-Air Ministers. In Italy there is none, for although that country has an independent Air Force, this depends from a Commissioner for Aeronautics and not from a regular Air Ministry. As to France, where M. Laurent-Eynac is often referred to as the "Air Minister," this is only a title of courtesy, for his real title is "Under Secretary of State for Aeronautics," and his bureau depends from the Ministry of Public Works.

Therefore, Great Britain is the only country that has the sagacity to make its air force equal in status to its military and naval forces. Perhaps it would be proper to go further and say that Great Britain has made its air force its "first line of defense." Lord Thomson's arrival in this country on a lecture tour will give the American people an opportunity to see and hear one of these new types of cabinet officers.

Regardless of the interesting messages that he undoubtedly will convey to the American public, he will be chiefly regarded as a symbol of a new era in national defense. And, as he has pointed out already, the consolidation and unification of air forces of a country under a responsible cabinet head will probably lead ultimately to a complete consolidation of all the defense departments under a single control. But until that obviously correct organization plan is achieved, the tendency will be toward unification of the governmental air arms.

What Airplanes Cost

ANYONE who has wondered what airplanes cost will be enlightened when they have finished reading this issue of AVIATION. The costs that are shown in the tables give what can be considered a catalogue of American aircraft prices. No more impressive figures have ever been available and while condensed tables of figures are tedious reading, they compress into small space the facts needed for discussion.

Expenditures of Government with Aircraft Industry

First Statement Made Available by Congressman La Guardia

AVIATION has made two investigations as to costs in the aircraft field. It is now able to present a set of interesting figures that will show to some extent what money has been spent with the aircraft industry, what the government has received and certain conclusions that can be drawn from the figures thus far made public.

The following tables were made public by Congressman F. H. LaGuardia, a Major in the Air Service during the war and a keen student of governmental aviation. In a speech delivered on Jan. 7, 1925, and reprinted in the *Congressional Record* of that date, he said:

"While we have spent several million dollars for planes, the orders have been spasmodic, uncertain and a sound permanent industry has not been developed. The system of the departments each having its favorites, to permit one concern to develop a plane, to buy that plane and a few more perhaps from the original firm designing it, and then placing the order for duplicates to mushroom small organizations without heavy overhead engineering expense, has been hardly fair. At this stage of the industry, we should continue our competitive system of bidding, but the work should be divided as equally as possible among such concerns as are able to guarantee to the Government that they have the capital, the engineering ability and the experience necessary to do the work. The system of sending out bids and then modifying the contract afterwards should be discontinued. The Government should treat the industry fairly and has a right to expect the industry to treat the Government fairly."

War Time Aviation Cost

The other two studies of aviation costs made by AVIATION have lead to very definite results. The first investigation was made as to the cost of Army War Aviation. Loose statements about "a billion and a half dollars" being spent for aircraft have not been made since the definite figures became available. As it is usually the case with government figures., it is difficult to close the books and call the amounts final. But for all practical purposes the cost of Army War Aviation can be summarized as follows:

Total Appropriations	$1,691,854,758.00
After Reversion, Refunds, Cancellations and Recall	569,577,563.35
Estimated Value of property on hand at end of war	187,446,449.85
Net cost of Army War time Aviation	382,131,113.50

To this should be added the net cost of Wartime Naval Aviation which gives an estimate in round figures for the entire cost of Wartime aviation at $425,000,000.

An interesting corollary to this figure is that the Army received for its expenditure, 41,953 aeronautical engines from the United States and 7,059 from abroad, 13,894 airplanes from the United States and 5,229 from abroad, 41,367 balloons, 61 flying fields and aero stations in the United States and 31 abroad, $41,817,220.11 worth of machine guns (98,555), airplane fabric, oil (82,159,751 gal.) gasoline (249,612,095 gal.), lumber (197,635,000 ft.) and airplane accessories. There had been trained 12,449 airplane and balloon pilots.

Post War Aviation Cost

The second investigation concerned the cost of aviation to the government since the war. Of this study our readers are familiar. The latest figures available, as officially given by the Air Service to the House investigation committee for the five fiscal years 1920-24 inclusive, follow:

Army Air Service	$246,310,209.51
Navy Air Service	177,923,898.39
Air Mail Service	8,067,052.46
National Adv. Com. for Aero.	1,082,126.85
TOTAL for five year period	$433,383,287.21

The next and obvious question to be asked is how much of this was spent for aircraft, engines and lighter-than-air development and how much for operating overheads.

To summarize, the figures show that the aircraft industry has been paid by the government air services for the four years 1920-1923, (Navy includes 1919,) inclusive, a total of $43,254,818.47 for airplanes, engines and lighter than air equipment. This was divided as follows:

Army Air Service Aircraft	$18,448,670.89
Engines, etc.	10,209,653.95
Naval Air Service Airplanes and engines	14,598,493.63
TOTAL	$43,254,818.47

In this figure is not included the great lighter-than-air development of the Navy. Nor does it include $4,270,246.25 spent at the Naval Aircraft Factory for aircraft, nor $1,103,185.89 spent at McCook Field for aircraft.

Distribution of Contracts

From the letter of Secretary Davis and Table II, an approximate estimate can be secured as to the number of airplanes the Army Air Service has secured in the four years 1920-1923 inclusive. It has rebuilt 1610 DH4's, ordered 681 new airplanes and built ten at McCook Field. The following distribution shows the types ordered with the costs.

ARMY AIR SERVICE

Remodelled DH's				1610	1610
New Planes From the Industry					
XBIA's	@	$ 12,300	ea.	42	
SE5A's	@	4,000	ea.	50	
MB3's	@	15,000	ea.	62	
MB3A's	@	7,600	ea.	200	
Oreneo D's	@	11,600	ea.	50	
PW5's	@	10,400	ea.	10	
PW8's	@	16,000	ea.	25	
MB2's	@	53,000	ea.	20	
MBS1's	@	23,000	ea.	85	
GAX's	@	46,000	ea.	10	
OW1	@	138,000	ea.	1	
NBL1 Barling	@	351,000	ea.	1	
VE7's	@	12,000	ea.	7	
VE9's	@	9,100	ea.	27	
TA3's	@	8,100	ea.	10	
TW3's	@	8,000	ea.	20	
Messengers	@	4,300	ea.	6	
"	@	3,500	ea.	20	
Loening Seaplanes	@	13,500	ea.	8	
Transport	@	12,700	ea.	10	
Single Seater Pursuit	@	30,000	ea.	3	
Verville Sperry Racer	@	25,000	ea.	3	
Curtiss Eagles	@	25,000	ea.	3	
Thomas Morse Racers	@	16,000	ea.	3	
Loening Racer	@	30,000	ea.	3	
Curtiss Racer	@	38,000	ea.	2	681
From Industry				681	
From McCook Field (See Table III)					
PW1	@	$ 45,747.82		1	
TP1	@	32,221.36		1	
GAX	@	71,632.13		1	
CO1	@	48,028.94		1	
CO2	@	39,397.52		1	
TW1	@	46,934.89		1	
XBIA's	@	36,986.52		2	
CO5	@	32,349.51		1	
VCP1*	@			1	
From McCook Field				10	10
Total Planes for Air Service					2301

*The Verville Packard racer was built before a cost system was installed at McCook Field and costs are not available.

From Table V, it will be seen that the Naval Air Service has secured from the aircraft industry since July 1, 1919, a total of 485 airplanes. During the same period there were built at the Naval Aircraft Factory at Philadelphia 292 airplanes at a total cost of $4,270,246.25. The itemized quantities and the unit prices can be found in Table VII.

What the Tables Show

Taking the tables individually for discussion:

Table I indicates that few of the aircraft companies had a constant flow of orders. When orders were given, each year, they were of such a wide range in amounts that it would be difficult to keep any business organization running without great overheads. The Air Service can claim that it has given large orders to the industry but it has not received aircraft that have satisfied its requirements. The aircraft industry can reply that it has been building to the requirements of the services rather than toward developing its own types. It will complain of a lack of continuity of plan and a policy. The fact will remain that large sums have been spent and practically all the aircraft in the Air Service are obsolete. It will be pointed out that the Air Service Engineering Division where $17,000,000 had been spent to secure engineering direction, has been at fault in not having a continuing policy and adhering to it. No one will attempt to give any positive answer to the problem. The figures themselves will probably awaken the aeronautical public to the large sums involved in aircraft work.

Table II gives the itemized costs for all planes manufactured. The outstanding feature of this table is the amount spent for charges in aircraft after the original order had been let. It indicates either that the Engineering Division did not know good aircraft when they were submitted or by constant changing of the design made them better or worse.

Table III is a very clear indication of the cost of experimental aircraft design and construction. It will always be a detailed statement of why aircraft in small quantities command such high prices.

Funds Reverted to Treasury

Table IV is noteworthy for one new fact. It shows that $3,621,178 of the 1921-1922 appropriation for naval areonautics reverted to the Treasury unspent. And this, at a time when Congress was being blamed for a lack of appropriations. The amount allotted for aircraft in each year should be considered in connection with the above fact and also with the expenditure for aircraft at the Naval Aircraft Factory (Table VII).

Table V gives the number of planes built for the Navy and the unit cost. The prices range for the Sperry Bomber at $103,485, downward. The wide variation of costs are to be seen in the prices for bombing planes. By comparing these prices with prices paid for the same planes by the Army, further price comparisons may be had.

Table VI is a recapitulation of the actual payments made to aircraft companies by the Navy during five years ending 1923. It should be noted that this table is for five years while the Army Air Service tables are for four years. These payments also include all engines purchased, as well as spare parts, repair work and other work. Also, it does not include the expenditures for lighter-than-aircraft which are included in the Army Air Service figures.

Table VII shows that 292 airplanes have been built at the Naval Aircraft Factory since 1919. A calculation using the unit price and the number of planes made gives a total expenditure of $4,270,246.25 for airplanes at the government factory since 1919. In considering the unit price when compared to the prices for planes at McCook Field it should be noted that the planes at the Naval Aircraft Factory were practically all production jobs and the cost of design and engineering not included.

Letter Giving Cost of All Army Types to 1924

WAR DEPARTMENT,
Washington, Sept. 18, 1923.

Hon. F. H. LAGUARDIA,
276 Fifth Avenue, New York, N. Y.

MY DEAR CONGRESSMAN: In reply to your letter of July 18, asking for certain information in regard to the procurement of aircraft by the Army Air Service, the following is furnished you:

The appropriations for the four fiscal years since the close of the war are as follows—

1920	$25,000,000
1921	33 0 0,000
1922	19,2 0,000
1923	12,000 000

The following types of airplanes have been built, or are building, since the war:

Remodeled DH-4s: These planes have been changed from the war-produced models by moving the pilot's cockpit back of the gasoline tank and moving the landing gear forward several inches, thus providing a plane somewhat safer than that made during the war. This plane is used for observation, light bombardment, and general utility. The cost of remodeling varies from about $1,100 immediately after the war to $2,300 at the present time, the increase being due chiefly to deterioration in the planes, which requires more repair work. Large numbers have been remodeled by this method. In addition, 50 were remodeled in 1923 and 100 in 1924 by rebuilding with a steel fuselage at a cost of $2,400 each. Further rebuilding of the DH-4s will be according to this plan.

XB-1A's: Forty-two of these were ordered in 1920 at a cost of about $12,300 each. This is a two-seater corps observation plane.

SE-5A's: Fifty of these planes have been built since the war with certain improvements over the war-produced model at a cost of about $4,000 per plane. They are being used for training purposes at the advanced flying school.

MB-3's: Sixty-two of these were ordered in 1920 at a cost of approximately $15,000 each. This is a single-seater pursuit airplane.

MB-3A's: Two hundred of these were ordered in 1921 at a cost of approximately $7,600 each. This is an improved and strengthened MB-3. It is the present standard pursuit plane and all pursuit squadrons are equipped with it.

Oreno D's: Fifty were ordered in 1920 at a cost of approximately $11,600 each. This was a single seater pursuit plane which has been obsoleted and taken out of service.

PW-5's: Ten of these were ordered in 1922 at a cost of about $10,400 each. This is a single seater pursuit plane of high performance.

PW-8's: Twenty-five of these have just been ordered (1924) at a cost of $16,000 each. This is a single seater, steel fuselage, pursuit plane showing the highest performance yet obtained.

MB-2's: Twenty of these were ordered in 1920 at a cost of approximately $53,000 each. This is a short distance night bomber, dual engine, capable of carrying 2,000 pounds of bombs.

NB-S1's: Eighty-five of these were ordered in 1921 and 25 in 1922 at an average cost of approximately $23,000. This is an improvement on the MB-2 mentioned above and is used for bombing.

GA-X's: Ten of these were ordered in 1920 at a cost of approximately $46,000 each. This plane is a three seater, armored, dual engined, ground attack plane.

The *"Owl"* is a giant bombing plane purchased in 1920 at a cost of $138,000. This plane is capable of lifting 4,000 pounds in bombs.

NB-L-1: This plane was ordered in 1920 at a total cost of $351,000. It is the largest bomber built in the United States and is capable of carrying 10,000 pounds in bombs.

VE-7's: Seven of these planes were ordered in 1921 at a cost of $12,000 each. This is a two seater training airplane of high performance.

VE-9's: Twenty-seven of these were ordered in 1922 at a cost of approximately $9,100 each. This is an improvement over the VE-7 mentioned above.

TA-3's: Ten of these were ordered in 1922 at a cost of approximately $8,100 each. This is a primary training plane equipped with an air-cooled motor and was purchased for service test.

TW-3's: Twenty of these were ordered in 1923 at a cost of about $8,000 each. This is a primary training plane with water-cooled motor and steel fuselage.

Messenger airplanes: Six of these were ordered in 1921 at a cost of approximately $4,300 each, and 20 were ordered in 1922 at a cost of about $3,500 each. This is a small messenger plane equipped with air-cooled motor capable of landing in very small fields.

Loening seaplanes: Eight of these were ordered in 1923 at a cost of about $13,500 each. This is a high-speed, duralumin-body seaplane used for rescue purposes at stations on the water.

Transport airplanes: Ten of these were ordered in 1923 at a cost of $12,700 each. This is a plane designed for transportation of supplies and personnel.

In addition there have been a number of experimental airplanes, built for development purposes, such as the Curtiss, Verville-Sperry, and Thomas-Morse special speed planes.

The following airships have been purchased since the war:

AA pony blimp: Two of these were purchased in 1920 at a total cost of $51,500. This is a small airship of approximately 38,500 cubic feet.

Roma: This was purchased in 1920 from the Italian Government at a cost of $194,000. It was a large semirigid airship with a capacity of 1,200,000 cubic feet.

Coastal airships: Three of these were purchased in 1920 at a total cost of $264,000. The capacity is about 180,000 cubic feet.

Pony blimp: Two of these were purchased in 1921 at a cost of $47,000. This ship has a capacity of 37,500 cubic feet.

Military airship: This was purchased in 1921 at a cost of $147,000. This ship has a capacity of 180,000 cubic feet.

U. S. M. B.: This ship was purchased in 1921 at a cost of $34,000. Its capacity is 47,500 cubic feet.

Towing airship: This airship was purchased in 1921 at a cost of $45,000. Its capacity is 40,000 cubic feet.

TC's: Three of these were purchased in 1922 at a cost of $82,000 each, and three more in 1923 at a cost of $45,000 each. These ships are twin-engined training ships of capacity of about 200,000 cubic feet.

A's: Two of these were ordered in 1922 at a cost of $72,000 each. They are twin engined with a capacity of about 130,000 cubic feet.

RS-1: This ship was ordered in 1922 at a cost of $475,000. It is a long-range reconnaissance airship, semirigid, with four Liberty motors, and has a capacity of about 665,000 cu. ft. * * *

Sincerely yours,

DWIGHT T. DAVIS,
Acting Secretary of War.

Drawing Conclusions

What can be said of these figures?

The public will say that there has been a great expenditure with small results. It will be astonished at the variation of prices paid by the Services to the industry and still more surprised at the cost of experimental work at McCook Field. It will ask who checks the expenditures after they have been made to see whether wise use has been made of the money given to the Services. It will also ask why these figures are not available in such form that clear comparisons can be made. It will wonder whether a unified purchasing department would not have secured better prices by quantity ordering.

The Air Service will probably say that it has spent money with the aircraft industry, but has not secured planes that are suitable to its needs. It will show that it has only done experimental design at McCook Field. It will claim that with all the money spent with the industry that it should have by this time turned out more acceptable planes. It will show that it has given civilian designers every chance to design and build aircraft without satisfactory results.

The Naval Air Service will probably point to its large expenditures with the industry and state that the Naval Aircraft Factory was used as a place to secure comparative costs of aircraft production. It will show that it requires specialized types for naval uses and that it has obtained these both from its own factory and the aircraft industry. It will claim credit for most of the aircraft engine development. It will show that it has spent a smaller amount of money than the Army and secured all the leading records. It will state that it no longer manufactures airplanes in production at the Naval Aircraft Factory.

The Industry Viewpoint

The Aircraft Industry will probably interpret these figures as a complete vindication of its present position. It will claim that owing to the present methods of purchasing, eight of the aircraft companies have suspended all aircraft work or gone into the hands of a receiver. It will claim that there has been no constant flow of work. It will show the effect of competitive bidding on prices. It will claim that it has been subjected to constant change of policy and planning. It will complain of foreign competition. It will point out that companies without engineering overheads or design departments have been allowed to compete with well organized establishments. It will show that there has been no effort made to stabilize the industry by the practice of subcontracting. It will point to the costs of design and development at McCook Field as an illustration of the high cost of development work. It will show that proprietary rights have been entirely taken over by the government.

The enemies of aviation will probably try to use these figures to show the great expense of aircraft, and by comparison, for instance, show that battleships are cheaper when considered broadly. Another class will use these figures to indicate the great cost of air armament and urge that some measures be taken to stop competition among governments for air supremacy.

All AVIATION can say at this time is that it congratulates Congressman LaGuardia for making these figures public and praises the effort he has made to find out what aircraft are costing. It is hoped that in the future more complete figures will be available so that more comparisons can be made.

Table I. Total Army Aircraft Expenditures 1920-1923

Statement of obligations incurred by United States Army Air Service under contracts for airplanes, airships, and balloons, placed with contractors indicated below during the period of July 1, 1919, to June 30, 1923.

Contractor	1920	1921	1922	1923	Total
Aeromarine Plane & Motor Corporation	$229,151.75	$183,150.00	$693,970.80	.....	$1,106,272.55
Airships Manufacturing Co.	.....	84,542.30	.....	$133,494.00	218,036.30
B. A. T. Co., through M. A. London	.....	9,600.00	.....	.....	9,600.00
Boeing Airplane Co.	686,120.63	1,836,485.47	92,645.70	172,663.89	2,787,915.69
Chance Vought Corporation	13,965.00	84,966.00	277,293.35	.....	376,224.35
Consolidated Aircraft Co.	.....	.....	.....	182,500.00	182,500.00
Connecticut Aircraft Co.	.....	33,660.00	6,400.00	.....	40,060.00
Cox Klemin Aircraft Co.	.....	.....	56,500.00	53,800.00	110,300.00
Curtiss Aero & Motor Corporation	733,513.02	1,303,686.67	246,000.00	90,000.00	2,373,199.69
Dayton Wright Co.	847,005.36	130,757.70	109,837.06	15,800.00	1,103,400.12
Eberhart Steel Products Co.	.....	.....	234,128.74	.....	234,128.74
G. Elias & Bro. (Inc.)	65,600.00	.....	170,000.00	.....	235,600.00
Anthony H. G. Fokker	.....	101,271.93	245,600.00	74,519.00	421,390.93
Gallaudet Aircraft Corporation	239,697.85	388,624.39	88,839.68	86,080.00	803,241 92
Goodyear Tire & Rubber Co.	51,500.00	214,048.00	879,351.85	86,511.00	1,231,410.85
Huff-Daland Co.	85,000.00	.....	15,000.00	30,000.00	80,000.00
Italian Government	194,000.00	.....	.....	.....	194,000.00
J. L. Aircraft Co.	100,000.00	.....	.....	.....	100,000.00
L. W. F. Engineering Co.	458,848.12	1,217,852.72	212,000.00	147,757.00	2,036,457.84
Lawrence Sperry Aircraft Co.	139,000.00	77,085.67	187,155.83	53,800.00	457,041.50
Loening Aero Engineering Corporation	92,950.00	136,500.00	215,616.24	133,360.00	578,526.24

Statement of obligations incurred by United States Army Air Service under contracts for airplanes, airships, and balloons, placed with contractors indicated below during the period of July 1, 1919, to June 30, 1923—Continued

Contractor	1920	1921	1922	1923	Total
Glenn L. Martin Co.	$1,253,982.62	.....	$12,127.63	.....	$1,266,110.25
Ordnance Engineering Corporation	228,488.00	.....	.....	.....	228,488.00
Thomas Morse Aircraft Co.	1,209,248.92	$48,600.00	167,462.00	.....	1,425,310.92
Wittemann Aircraft Co.	351,000.00	.....	93,975.00	$86,080.00	531,055.00
United States Navy Department	264,400.00	54,000.00	.....	.....	318,400.00
Total	7,193,471.27	5,904,830.85	4,003,903.88	1,346,464.89	18,448,670.89

Statement showing total appropriation for Army aviation and amount obligated by fiscal years, for aircraft, engines, accessories, etc., from July 1, 1919, to June 30, 1923.

Fiscal year	Appropriation	New aircraft	Engines, instruments, parachutes, combat, photo equipment, etc.	Total
1920	$25,000,000.00	$7,193,471.27	$1,874,465.90	$9,679,254.62
1921	33,000,000.00	5,904,830.85	4,485,583.32	10,390,414.07
1922	19,200,000.00	4,003,903.88	2,169,666.71	6,173,570.59
1923	12,700,000.00	1,346,464.89	1,679,938.92	3,026,403.81
Total	89,900,000.00	18,448,670.89	10,209,653.95	28,658,324.84
For experimental planes built by engineering division, McCook Field, July 1, 1919, to June 30, 1923	.....	.....	.....	1,103,185.89
Total	89,900,000.00	.....	.....	29,761,510.73

Table II. Army Aircraft Orders 1920-1923

Aircraft ordered by United States Army Air Service

[The complete table as given in the *Congressional Record* for Jan. 7, 1925 pp. 1429-1432 gives contract numbers and dates of order, types, termination date and reason in each case for increase in prices. These include increases due to changes indicated by *, cancellations of part of order indicated by †, and others.—ED.]

FISCAL YEAR 1920[1]

Contractor	Number	Description	Original contract cost	Total obligations to June 30, 1923
		Airplanes		
L. W. F. Engineering Corporation	75	Remodeled DH-4 airplanes	$74,812.50	$88,812.50*
....do	6	....do	8,985.00	8,985.00
....do	47	....do	63,450.00	87,650.00*
....do	13	....do	20,605.00	20,605.00
....do	6	....do	8,100.00	8,100.00
....do	10	Same as above, equipped with twin engine Hall-Scott Liberty 6-cylinder engine	86,000.00	106,000.00*
Thomas-Morse Aircraft Co.	75	Remodeled DH-4 airplanes	74,812.50	86,062.50*
....do	47	....do	63,450.00	63,450.00
....do	41	....do	57,031.00	57,031.00
....do	62	Single-seater day pursuit planes, including spares	895,166.00	1,002,705.42*
Aeromarine Plane & Motor Co.	75	Remodeled DH-4's airplanes	74,812.50	86,062.50*
....do	47	....do	63,450.00	63,450.00
....do	58	....do	79,692.00	79,639 25*
Boeing Airplane Co.	48	....do	64,800.00	65, 28.0*
....do	63	....do	86,247.00	91,180.50*
....do	10	3-seater ground attack planes, including spares	529,912.13	529,912.13
Curtiss A. & M. Corporation	47	Remodeled DH-4's airplanes	63,450.00	63,450.00
....do	3	Single-seat night pursuit planes	110,000.00	85,536.82†
....do	50	Single-seat day pursuit plane, including spares	579,564.37	584,526.20*
Dayton Wright Airplane Co.	48	Remodeled DH-4 airplanes	64,800.00	65,796.24*
....do	64	Remodeled DH-4 airplanes, 48 equipped with 300-hp. Hispano engines	87,552.00	217,171.93*
....do	42	Corps observation airplanes, including spares	563,890.10	564,037.19*
Gallaudet Aircraft Corporation	75	Remodeled DH-4 airplanes	74,812.50	86,062.50*
....do	47	....do	63,450.00	63,450.00
....do	60	....do	82,320.00	82,085 35
....do	6	....do	8,100.00	8,100.00
L. W. F. Engr. Corporation	1	Giant bombardment plane "Owl"	138,275.00	138,495.62*
J. L. Aircraft Corporation	3	Metal monoplanes, 2 engines and spares	100,000.00	100,000.00
Ordnance Engr. Corporation	2	2-seater Infantry liaison airplanes	123,500.00	123,500.00

[1]Percentage of increase, 18 3/10 per cent.

Aircraft ordered by United States Army Air Service

FISCAL YEAR 1920

Contractor	Number	Description	Original contract cost	Total obligations to June 30, 1923
		Airplanes		
Ordnance Engineering Corporation	3	Single-seater day pursuit planes	$97,500.00	$94,500.00
....do		Royalties on 50 Type 1 planes, built by Curtiss A. & M. Co., on contract 269	10,488.00	10,488.00
Lawrence Sperry Aircraft Co.	5	Messenger torpedo airplanes	139,000.00	139,000.00
Loening Aero Engineering Corporation	3	Single-seater day pursuit planes	90,000.00	92,950.00*
Witteman Aircraft Corporation	2	Long-distance night bombardment, including spares	375,000.00	351,000.00†
Huff-Daland & Co.	3	2-seater training airplanes	35,000.00	35,000.00
G. Elias & Bro.	3	....do	65,600.00	65,600.00
Chance Vought Corporation	1	2-seater training airplanes, including spares	13,965.00	13,965.00
Glenn L. Martin Co.	20	Short-distance night bombardment	1,192,607.81	1,253,982.62*
Total				6,683,571.27
		Airships		
Goodyear Tire & Rubber Co.	2	Pony blimps, tractor type	45,600.00	51,500.00*
Italian government	1	Italian semirigid airship "Roma"	236,000.00	194,000.00
U. S. Navy Department	3	Coastal airships	264,400.00	264,400.00
Total			5,876,200.41	509,900.00
Total, fiscal year 1920				7,193,471.27

FISCAL YEAR 1921[1]

Contractor	Number	Description	Original contract cost	Total obligations to June 30, 1923
		Airplanes		
Aeromarine Plane & Motor Corporation	3	Single seater armored pursuit planes	$99,000.00	$99,000.00
....do	60	Remodeled DH4 planes	84,000.00	84,150.00*
B. A. T. Co., through M. A. London, England	1	Bantam airplane, 1 Wasp engine, 2 sets spares	9,600.00	9,600.00
Boeing Airplane Co.	3	3-seater ground attack planes	239,450.00	178,500.00†
....do	200	Single-seater day pursuit planes, including spares	1,583,741.12	1,657,985.47*
Chance Vought Co.	7	2-seater training planes, including spares	84,966.00	84,966.00*
Curtiss A. & M. Corporation	3	Curtiss Eagle planes	75,000.00	75,000.00
....do	50	Short distance night bombers and spares	1,167,740.00	1,228,686.67*
Dayton Wright Co.	3	2-seater training planes	42,500.00	42,500.00
....do	3	Alert airplanes (air cooled)	90,000.00	88,257.70
A. H. G. Fokker, through M. A., The Hague	2	Monoplanes, Fokker D type	5,271.93	5,271.93
Anthony H. G. Fokker	2	Fokker transport airplanes	60,000.00	60,000.00
....do	2	Single-seater armored combat airplanes	36,000.00	36,000.00
Gallaudet Aircraft Corporation	3	Day bombardment planes	375,000.00	253,000.00†
....do	60	Remodeled DH4 planes	84,000.00	84,624.39
....do	3	Single-seater day pursuit planes	119,000.00	51,000.00†
L. W. F. Engineering Corporation	150	Remodeled DH4 airplanes	210,000.00	211,790.84
....do	35	Short distance night bombers, and spares	948,631.95	1,006,061.88*
Lawrence Sperry Aircraft Co.	6	Messenger planes	25,500.00	44,500.00
....do	6	....do	24,000.00	32,585.67*
Loening Aero Engineering Corporation	3	Single-seater day pursuit planes	110,000.00	87,500.00†
....do	2	....do	49,000.00	49,000.00
Thomas-Morse Aircraft Corporation	3	Racing airplanes	48,600.00	48,600.00
U. S. Navy Department	1	All metal single-seater pursuit plane, "Dornier Type D1"	9,000.00	9,000.00
Total				5,527,580.55
		Airships		
Goodyear Tire & Rubber Co.	2	Pony blimps, 35,000 cu. ft. and spares	46,655.00	47,048.00*
....do	1	Military airship, 180,000 cu. ft.	147,000.00	147,000.00
Airships Manufacturing Co.	1	Twin engine, non-rigid-airship type U.S.M.B.	34,896.74	34,736.94
U. S. Navy Department	1	Single engine towing airship	45,000.00	45,000.00
Total				273,784.94

Aircraft ordered by United States Air Service—Continued

FISCAL YEAR 1921

Contractor	Number	Description	Original contract cost	Total obligations to June 30, 1923
		Balloons		
Goodyear Tire & Rubber Co.	1	Spherical free balloons, 80,000 cu. ft. capacity, racing type	$8,000.00	$8,000.00
....do	10	Supply balloons, 5,000 cu. ft.	12,000.00	12,000.00
Connecticut Aircraft Co.	1	Spherical free balloon, 80,000 cu. ft. capacity, racing type	4,000.00	4,000.00
....do	4	Observation balloons, 37,500 cu. ft., type A.P.	27,000.00	26,000.00
....do	4	Supply balloons, 5,000 cu. ft	3,560.00	3,660.00*
Airships Manufacturing Co.	20	....do	17,960.00	17,960.00
....do	8	Spherical free balloons, 35,000 cu. ft.	31,845.36	31,845.36
Total			5,957,918.10	103,465.36
Total for fiscal year 1921				5,994,830.85

FISCAL YEAR 1922[1]

Contractor	Number	Description	Original contract cost	Total obligations to June 30, 1923
		Airplanes		
Aeromarine P. & M. Corporation	25	Bombardment planes and spares	$560,492.00	$601,709.41*

Boeing Airplane Co.	50	Remodeled DH4 planes	98,157.92	92,645.70*
Chance Vought Corporation	27	Training planes VE9 and spares	277,293.35	277,293.35
Cox-Klemin Aircraft Corporation	3	2-seater training planes	54,000.00	56,500.00*
Curtiss A. & M. Corporation	2	Short-distance night bombers	170,000.00	170,000.00*
....do	2	Racing planes and spares	76,000.00	76,000.00
Aeromarine P. & M. Corporation	50	Remodeled DH4 planes	89,754.00	92,261.39*
Dayton-Wright Co.	10	Primary training planes, TA3 and spares	78,460.00	81,398.00*
...do	2	Training planes TW3's	22,500.00	28,439.06*
Eberhart Steel Products Co.	50	Single-seater pursuit, including bomb rack releases and spares	166,110.00	234,128.74
G. Elias & Bro. (Inc.)	2	Short-distance night bombers	170,000.00	170,000.00
Anthony H. G. Fokker	1	Single-seat day pursuit plane	10,000.00	10,000.00
...do	1	2-seater training planes	5,000.00	5,000.00
....do	3	Corps observation planes	100,000.00	100,000.00
....do	10	Single-seater day pursuit planes, including spares	130,600.00	130,600.00†
Gallaudet Aircraft Corporation	3	Corps observation planes	110,000.00	88,839.68
Huff Daland & Co.	....	Remodeling 2 training planes	15,000.00	15,000.00
L. W. F. Engineering Corporation	2	Short-distance night bombers	170,000.00	170,000.00
Lawrence Sperry Aircraft Co.	3	Special type speed planes	75,000.00	98,189.65*
....do	20	Messenger planes, air-cooled engine and spares	86,664.62	88,966.18*
Loening Aero Engineering Corporation	10	Monoplanes, pursuit type, PW2's, and spares	146,500.00	147,116.24*
....do	2	Racing planes	76,000.00	68,500.00
Glenn L. Martin Co.	3	Long-distance night bomber	332,000.00	12,127.63
Thomas-Morse Aircraft Co.	2	Racing planes	81,000.00	76,000.00
....do	50	Remodeled DH4 planes	90,202.00	91,462.00
Witteman Aircraft Co.	50	Remodeled DH4 planes	87,500.00	93,975.00*
L. W. F. Engineering Corporation		Repair and reconditioning of giant bomber "Owl"	27,000.00	27,000.00
...do		Further repairs made to above	15,000.00	15,000.00
Total				3,118,152.03
		Airships		
Goodyear Tire & Rubber Co.	3	Airships, improved type	213,500.00	256,008.00*
....do	2	Airships, improved type and spares	139,504.70	144,993.85*
....do	1	Semirigid, long range reconnaisance airship and constructed around 4 300 hp. model 12-a Liberty engines	475,000.00	475,000.00

Aircraft ordered by United States Army Air Service—Continued

FISCAL YEAR 1922

Contractor	Number	Description	Original contract cost	Total obligations to June 30, 1923
		Airships—Continued		
Goodyear Tire & Rubber Co.	1	High altitude spherical balloon	$3,350.00	$3,350.00
Total				876,001.85
		Balloons		
Connecticut Aircraft Co.	1	High altitude observation type balloon	6,400.00	6,400.00
Total				9,750.00
Total for fiscal year 1922				4,003,903.88
Total original contract cost			4,157,988.59	

FISCAL YEAR 1923

		Airplanes		
Boeing Airplane Co.	50	Repair and remodel DH4 into DH4B's with steel fuselage	$157,500.00	$157,500.00
		Training planes, TW3's and spares	182,500.00	182,500.00
Consolidated Aircraft Co.	20	Remodeled DH4 planes	53,800.00	53,800.00
Cox-Klemin A. C. Corporation	25	Single seater day pursuit planes	90,000.00	90,000.00
Curtiss A. & M. Corporation	3	2-seater training planes	15,800.00	15,800.00
Dayton Wright Co.	1	Redesigned DH4 airplanes	15,000.00	15,163.89
Boeing Airplane Co.	3	Corps observation planes		
Anthony H. G. Fokker	5	and spares	74,519.00	74,519.00
Gallaudet Aircraft Corporation	40	Remodeled DH4's	68,080.00	86,080.00
Huff Daland & Co.	1	2-seater training plane, and spares	30,000.00	30,000.00
L. W. F. Engineering Corporation	10	Transport airplanes and spares	147,757.00	147,757.00
Lawrence Sperry Aircraft Co.	25	Remodeled DH4's	53,800.00	53,800.00
Loening Aero Engineering Corporation	8	Seaplanes, Model 23, with 3 sets spares	133,460.00	133,460.00
Witteman Aircraft Co.	40	Remodeled DH4's	86,080.00	86 080.00
Total				1,126,459.89
		Airships		
Goodyear Tire & Rubber Co.		3 transmissions for semi-rigid long range reconnaissance type airship; under contract 562	67,350.00	67,350.00
Airships (Inc.) (Airship Mfg. Co.)	3	Airships, improved type, 200,000 cu. ft. capacity	133,494.00	133,494.00
Total				200,844.00
		Balloons		
Goodyear Tire & Rubber Co.	4	Spherical balloons, 35,000 cu. ft. capacity	19,161.00	19,161.00
Total				19 161.00
Total for fiscal year 1923				1,346,464.89
Total original contract cost			1,346,301.00	

Table III. McCook Field Aircraft Costs

Number and types of airplanes built by engineering division, McCook Field, July 1, 1919, to June 30, 1923

TYPE I—SINGLE-SEATER PURSUIT AIRPLANE

(E. O. 2977, model PW1, quantity, 1)

Project, engineering, and planning	$10,641.96	
Design, drafting, and stress analysis	38,926.20	
Design, changes, and revisions	32,324.00	
		$81,892.16
Construction of—		
Tools, jigs, patterns, forms etc.	1,289.14	
Test specimen	1,476.69	
Wind-tunnel model	2,839.71	
Mock-up	1,762.22	
Sand-test model	23,773.28	
Flying model (1)	45,747.82	
		76,888.86
TESTS		
Wind tunnel, cooling, flight, propeller, etc.	2,903.58	
Static test of sand-test model	3,662.46	
		6,566.04
		165,347.06

TYPE V—TWO-SEATER PURSUIT AIRPLANE

(E. O. 3059, model TP1, quantity 1)

Project, engineering, and planning	$2,613.27	
Design, drafting, and stress, analysis	42,688.66	
Design, changes, and revisions	15,179.61	
		60,481.54
Construction of—		
Tools, jigs, patterns, forms, etc.	2,029.53	
Wind-tunnel model	1,155.22	
Sand-test model	18,991.69	
Flying model	32,221.36	
		54,397.80
TESTS		
Wind tunnel, cooling, flight, propeller, etc.	3,010.65	
Static test of sand test model	3,648.83	
		6,659.48
		121,538.82

TYPE VI—THREE-SEATER GROUND-ATTACK AIRPLANE

(E. O. 2877—Model GAX—Quantity 1)

Project, engineering and planning	$1,280.43	
Design, drafting and stress analysis	50,722.54	
		52,002.97

Construction of—		
Tools, jigs, patterns, forms, etc.	7,628.00	
Test specimens		
Wind-tunnel model	902.11	
Mock-up	1,560.99	
Sand-test model	30,674.14	
Flying model	71,632.13	
		112,397.37
Static test of sand-test model		8,381.68
		172,781.97

TYPE X—CORPS OBSERVATION AIRPLANE
(E. O. 3030—Model CO1—Quantity 1)
ALL METAL

Project, engineering, and planning	$3,017.08	
Design, drafting, and stress analysis	50,362.01	
Design changes and revisions	36,509.02	
		89,888.11
Construction of—		
Tools, jigs, patterns, forms, etc.	$9,735.89	
Test specimens	1,164.79	
Wind-tunnel model	1,725.91	
Sand-test model	30,663.53	
Flying model	48,028.94	
		$91,319.06
Static test of sand-test model		3,684.96
		184,892.13

(E. O. 3026; model, CO2; quantity, 1)

Project engineering and planning	$3,262.06	
Design, drafting, and stress analysis	64,576.23	
Design changes and revisions	13,118.42	
		80,956.71
Construction of—		
Tools, jigs, patterns, forms, etc.	9,624.89	
Wind-tunnel model	1,160.45	
Mock-up	2,874.01	
Sand-test model	23,260.07	
Flying model	39,397.52	
		76,316.94
TESTS		
Flight and and cooling tests	170.69	
Static test of sand-test model	3,195.37	
		3,366.06
		160,639.71

TYPE XV—TRAINING AIRPLANE
(E. O. 2947; model, TW1; quantity, 1)

Project engineering and planning	$3,004.70	
Design, drafting, and stress analysis	52,413.26	
		55,417.96
Construction of—		
Tools, jigs, patterns, forms, etc.	682.04	
Test specimens	339.46	
Mock-up	1,462.78	
Sand-test model	26,664.30	
Flying model	46,934.89	
		76,083.47
TESTS		
Flight and cooling tests	1,000.98	
Static test of sand-test model	3,449.65	
		4,450.63
		135,952.06

TYPE X—CORPS OBSERVATION AIRPLANE
(E. O. 2911; Model XB1A; quantity, 2)

Project engineering and planning	$1,584.95	
Design and drafting	37,251.34	
		$38,836.29
Construction of—		
Tools, jigs, patterns, forms, etc.	1,209.35	
Flying models (2)	73,973.03	
		75,182.38
		114,018.67

(E. O. 3114; Model CO5; quantity, 1)

Designing and drafting	$11,675.57	
Design changes and revisions	2,357.51	
		14,033.08
Construction of—		
Tools, jigs, forms, patterns, etc.	1,071.01	
Flying model	32,349.51	
		33,420.52
Flight and cooling tests		561.87
		48,015.47

TYPE I—SINGLE-SEATER PURSUIT AIRPLANE
(E. O. 1178; Model VCP1; quantity, 1)

Costs not available on this airplane. Work started before cost system was installed.

Above costs include all expenses incurred in connection with the orders, whether paid for from experimental funds or from other sources. The overhead includes increased compensation, telephone and telegraph expense, military supervision, trucking, rent of field, depreciation of plant and equipment, etc.

Table IV. Navy Appropriations 1919-1923

Year	*Appropriated*	*Unobligated*
1919-20	$25,000,000	$3,129,434
1920-21	20,000,000	2,500,709
1921-22	13,413,431	3,631,178
1922-23	14,683,950	27,107
1923-24	14,647,174	.....

DISPOSITION OF UNOBLIGATED BALANCES

1919-20. Transferred to 1922 appropriation.
1920-21. Transferred to 1922 appropriation.
1921-22. Reverted to Treasury.
1922-23. Will revert to Treasury June 30, 1925.
1923-24. Will revert to Treasury June 30, 1926.

Amount of each year's appropriation allotted for purchase of aircraft

1919-20	$3,127,250
1920-21	3,883,400
1921-22	5,323,000
1922-23	6,537,000
1923-24	5,798,950

[NOTE.—This does not include lighter-than-air craft.]

Table V. Cost of Navy Aircraft

TABLE V

Companies which have built aircraft for the United States Navy since July 1, 1919

Company	*Quantity*	*Model*	*Unit price*
Aerial Engineering Corp.	2	BR1	$24,125
Aeromarine Plane & Motor Co.	[1](50) 8	40	9,300
Do	3	AS	20,736
Kox-Klemin Aircraft Corp.	6	XS1	6,717
Curtiss Aeroplane & Motor Corp.	[1](70) 3	MF boats	8,000
Do	[1](4) 3	HS3	13,500
Do	1	CT	75,000
Do	2	CR	47,500
Do	23	TS	11,679
Do	11	....do	9,850
Davis-Douglas Co. (now the Douglas Co.)	3	DT	33,333
Do	18	DT2	21,815
Do	20	...do	15,154
Dayton-Wright Co.	1	WA	37,300
Do	1	WS	36,300
Do	11	DT2	22,765
Do	1	TW3	15,900
Huff-Daland & Co.		3HN1	16,000
Do		3HO1	14,000
Do		3HN2	13,667
Loening Aeronautical Engineering Corp.		1LS	14,000
Do		1M8	15,597
Do		10M80	12,950
Do		6M81S	14,520
Loughead Aircraft Corp.		2HS2	24,366
L-W-F Engineering Co.		20DT2	17,000
Glenn L. Martin Co.		2Martin bomber	42,000
Do		8Martin torpedo	51,000
Do		3M2O1	25,658
Do		6MO1	35,417
Do		6MS1	7,238
Do		30MO1	26,072
Jas. V. Martin		3K4	15,750
Lawrence Sperry Aircraft Corp.		1Sperry bomber	103,485
Thomas-Morse Aircraft Co.[3]		11MB3	
Do		1MB7	22,000
Lewis & Vought Corp.[4]		2CVE7	11,020
Do		40VE7SF	12,300
Do		21VE9	8,616
Do		6UO1	12,551
Do		1[5]UO1	11,507
Wright Aeronautical Corp.		2NW	30,000
Wright-Martin Aircraft Corp.[6]		2XB1A	18,500
Blackburn Aeroplane Co.		2Blackburn Swift	[8]32,800
Caspar Werke		2Heinkel-Caspar	[8]20,750
J. L. Aircraft Corp.		3JL6	27,100
Macchi Co.[7]		3Macchi	1,615
Morane Saulnier		6Morane Saulnier	4,567
Geo. Parnell & Son		2Parnell Panther	[8]12,230
Netherlands Aircraft Manufacturing Co.		3Fokker C1	[8]4,000
Do		3Fokker FT	[8]32,833
Van Berkel, Holland		1Dornier CS1	[8]15,000
Do		1Dornier D1	[8]9,000
Vickers (Ltd.)		1Viking IV	[8]31,950
Total	485		

[1]Numbers in parentheses indicate total number included in the contract.

Company	*Quantity*	*Model*	*Unit price*
G. Elias & Bro.	1	EM1	$17,000
Do	6	EM2	23,083

[3]Includes cancellation charge for 3 additional planes originally ordered.
[4]Through U. S. Army Air Service.
[5]Now Chance Vought Corp.
[6]Through U. S. Army Air Service.
[7]Two delivered
[8]With engine.
[9]Societa Anonyma Nieuport Macchi.
[8]Approximately, with engine.

Table VI. Payments to Aircraft Companies by Navy 1919-1923

Payments made to aircraft companies since Jan. 1, 1919

Company	1919	1920	1921	1922	1923	
Aerial Engineering Corporation	.....	.....	.....	$76,426.09	$5,100.00	$81,526.09
Aeromarine Plane & Motor Corporation	$62,389.84	.....	$77,092.91	151,507.25	180,952.84	471,942.84
Cox Klemin Aircraft Corporation	.....	.....	.....	5,000.00	33,324.48	38,324.48
Curtiss Aeroplane & Motor Corporation	2,581,657.13	$66,009.73	203,623.05	243,764.40	1,961,832 56	5,056,886.87
Davis Douglas Co. (The Douglas Co.)	.....	.....	57,186.86	209,087.45	687,822.28	954,096.59
Dayton Wright Co.	.....	.....	16,000.00	6,000.00	383,873.78	405,873.78
G. Elias & Bros.	.....	.....	39,527.67	126,296.94	2,439.71	168,064.32
Huff Daland & Co.	.....	.....	2,000.00	58,300.00	104,956.24	165,256.24
Loening Aeronautical Engineering Corporation	52,283.26	188,798.03	21,040.00	.....	.....	262,121.29
Loughead Aircraft Corporation	48,733.58	.....	.....	.....	.....	48 733.58
L-W-F Engineering Corporation	111,011.72	2,477.47	2,460.00	.....	372,669.03	488,618.22
Glenn L. Martin Co.	350.00	640,227.37	525.00	128,113.00	360,916.21	1,130,131.58
James V. Martin (Martin Aero. Factory)	1,332.90	500.00	43,594.99	.....	.....	45,427.89
Lawrence Sperry Aircraft Corporation	63,164.00	41,985.47	.....	.....	.....	105,149.47
Lewis & Vought Corporation (Chance Vought)	.....	224,990.00	569,736.80	129,394.66	219.650.18	1,143,771.64
Wright Aeronautical Corporation	.....	946,367.50	906,722.24	527,537.60	1,651,941.41	4,032,568.75
Total	$2,920,922.43	$2,111,355.57	$1,939,309.52	$1,661,427.39	$5,975,478.72	$14 598,493.63

Table VII. Costs at Naval Aircraft Factory

Type, number, and unit cost of aircraft built at Naval Aircraft Factory since 1919

Year	Type	Quantity manufactured	Unit cost
1919-20	F5L	50	$24,069.16
	MF	80	8,722.06
	SA1	3	3,071.85
	SA2	3	5,297.31
	HS3	2	28,272.54
	NC	6	123,376.00
	VE7G	10	12,382.06
	VE7GF	10	13,375.46
1920-21	VE7	16	6,720.87
	VE7SF	34	7,114.16
	M81	36	7,561.63
	PT1	15	16,548.20
	TS1	5	17,128.13
1921-22	TS2	4	13,756.20
	PT2	18	16,090.70
Total		292	

NOTE.—The above unit costs represent average costs to manufacture the plane only and do not include the engines, ordnance equipment, or radio. These items of cost are not included as this equipment is not standard. Some planes were not equipped with ordnance and some were not equipped with radio. Further, the invoice cost of engines, even of the same type, varies widely, probably depending upon the date of manufacture. For these reasons it is believed that any comparisons of cost to manufacture can be more intelligently made if the cost of this equipment is eliminated.

Giant Junkers Plane Projected

Ephémérides de l'Aéronautique of Paris, France, reports that at the last Universal Postal Congress, held in Stockholm, Sweden, the chief engineer of the Junkers Airplane Co. showed several delegates a scale model of a giant Junkers plane which is designed along totally new lines.

The scale model measured about 12 ft. in length and was made of duralumin and bronze. It showed all constructional details, including the compressed air and gasoline leads. The full size machine is to be a monoplane of 250 ft. span with a wing 20 ft. thick. The power plant will consist of six 1000 hp. engines of a new type, which will be mounted inside the wing.

The motive portion of this power plant will be situated at the trailing edge of the wing. The engines will be of Diesel crude oil type and will drive turbines by means of compressed air. These turbines will be located at the leading edge of the wing.

The machine will have no fuselage. Elevators and rudders will be situated in front of the wing, inside of which all loads will be accommodated. The landing gear will be retractible in flight. The pay load will be fifteen tons. The fuel load carried will give the ship a range of 15 hr. at a cruising speed of 140 mi./hr., which would give a cruising range of 2100 mi. The ship will be entirely constructed of duralumin.

The Junkers engineer insisted particularly on that a scale-reduced model of this ship had already been flown and found satisfactory, and that the new system of propulsion had also come up to expectations.

The Junkers company offered to some of the countries represented at the Stockholm Congress to equip air mail lines with such planes in case it should be granted a concession.

R. Aero Society Lectures

Following is the lecture program, 1924-1925 (Second Half) of the Royal Aeronautical Society of Great Britain:

Jan. 22, at 5.30 p. m.—Maj. R. V. Southwell, A.F.R.Ae.S., Superintendent of the Aerodynamic Department, National Physical Laboratory, on some recent work of that Department.

Feb. 5, at 5.30 p. m.—Air Commodore C. R. Samson, C.M.G., D.S.O., A.F.C., on "The Operation of Flying Boats in the Mediterranean."

Feb. 12, at 5.30 p. m.—Col. F. Searle, C.B.E., D.S.O., Managing Director of Imperial Airways, on "The Maintenance of Commercial Aircraft."

Feb. 19, at 7.00 p. m.—(Joint Lecture with the Institution of Automobile Engineers). Lt. Col. L. F. R. Fell, D.S.O., A.F.R.Ae.S., head of the Engine Section, Research Department, Air Ministry, on "Light Aeroplane Engine Development."

March 5, at 5.30 p. m.—Lt. Col. C. B. Heald, C.B.E., Medical Adviser to the Director of Civil Aviation, on "Some Medical Aspects of Air Transport."

March 19, at 5.30 p. m.—Capt. F. Tymms, M.C., who was in charge of the flying equipment of the Oxford University Expedition to the Arctic 1924, on "Practical Navigation of Aircraft."

March 26, at 5.30 p. m.—Dr. Eckener, Managing Director of the Zeppelin Airship Company, on "Modern Zepplin Airships."

Glenn L. Martin Gets Big Contract

A contract for the construction of forty CS1 three-purpose planes, worth approximately one million dollars, has been awarded by the Naval Bureau of Aeronautics to the Glenn L. Martin Co. of Cleveland. Work on the new order will begin immediately. A contract for thirty-five planes of this type was let to the Martin company last June, while an order for eight of these ships was placed with the Curtiss Aeroplane & Motor Co., Inc. of Garden City, N. Y. late in 1923. Upon completion of the new order the Navy will therefore have about eighty CS1 planes.

The CS1 type was developed by the Naval Bureau of Aeronautics with a view to having a single plane perform the duties heretofore undertaken by bombing, torpedo and scouting planes. This type will supplant two types now used in the Navy for bombing, torpedo dropping and scouting—the Douglas torpedo plane and the F5L flying boat.

The CS1 planes are convertible to either land or sea duty and will be used aboard the aircraft carrier Langley and the two aircraft carriers now under construction.

Planes Seek Lost Yacht

Two seaplanes from Pensacola Naval Air Station started on Jan. 14 a search along the Gulf coast for the yacht Olga with six prominent New Orleans men aboard. At the time the craft had been missing since Jan. 7.

Electric Dynamometers in Engine Development

By H. M. MARTIN

Ceneral Electric Co.

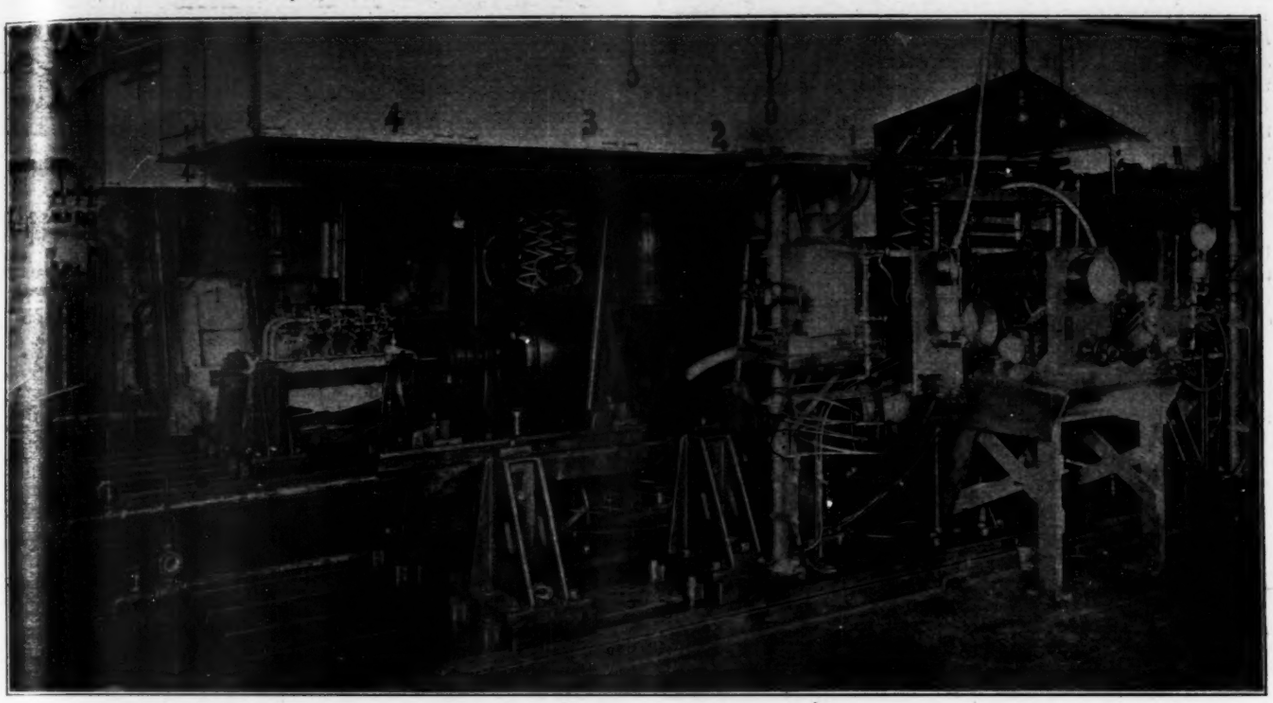

Fig. 1. Electric Dynamometers in the Experimental Laboratory of the Curtiss Aeroplane & Motor Co., Inc., at Buffalo, N. Y.

The story of man flight begins with Icarus, but between his mythical time and ours no more epoch-making event is recorded than that which took place on the sand dunes near Kitty Hawk, N. C., on Dec. 17, 1903, when the first engine driven Wright airplane rose from the ground carrying a man. From that time to 1908, the Wrights made a number of semi-private flights of considerable duration near Dayton, Ohio, which, strangely enough did not excite the world-wide interest that they deserved. In August of 1908, Wilbur Wright began a series of public flights in France, while Orville Wright followed him in September at Fort Myer, Va. Within the space of three weeks the world realized that man flight was accomplished; that a power-driven airplane capable of instant and exact response in the three planes of motion to the will of the operator was at its service.

The Wright airplane of 1908 has recently been described in a magazine article as a "bundle of sticks," but this is a calumny, since it was scientifically designed to the smallest detail of the smallest part. As an example of this, the parasitic resistance to motion through the air of the vertical struts connecting the upper and lower planes was reduced to a minimum by means of a properly stream-lined cross section, and the large, slow moving propellers were the result of long and careful tests on various pitches and diameters and speeds. Perhaps the most interesting and ingenious part of the whole device was the engine, which would be regarded almost as a toy in comparison with the superbly powerful motors of today. This small four-cylinder engine developed about 20 hp. It had no carburetor, but the fuel was injected into the inlet manifold by a power-driven pump. The ignition was make-and-break with the current supply from a direct current magneto, and, in starting, dry cells were used "hitched up" by temporary connections which were pulled off after the engine had started, leaving them on the ground.

With the essential principles of mechanical flight fully established, progress was rapid and we find that very soon the double propellers behind and pushing gave way to the single directly connected propeller in front, pulling. The fuselage came into existence as a container for the engine, fuel, pilot and pay load, and planes became larger, heavier and swifter, which necessitated more powerful engines.

How the Dynamometer Works

Several years before the Fort Myer flight, a new power measuring device had been invented and was being used by a few engine makers. This was the electric dynamometer. It would perhaps be too extreme a statement to say that this was the greatest single aid to progress in engine construction, since it is possible that inventive genius and mechanical ingenuity might have got along without it, but undoubtedly it was of immense assistance. This device is comprised of a rotor arranged to be driven by the engine and supported in ball bearings in a surrounding stator of symmetrical design which, itself, is also mounted in supporting ball-bearing pedestals. When the rotor is driven by an outside source of power, the magnetic interaction between it and the stator tends to make the latter turn in the same direction, but this attempted rotation is prevented by an arm connected to a torque-weighing mechanism. The construction is such that all the torque delivered to the rotor is transmitted to the stator, and it may therefore be accurately measured, while, at the same time, the rotor revolutions per minute are indicated by a tachometer. With the torque and speed known, the result is horsepower.

Other forms of power measuring apparatus had been known and some designs of water-cooled brakes had proved of value, particularly for large horsepowers at low speeds, but the electric dynamometer was the only "universal" outfit covering wide ranges of torque and speed, the electric instead of mechanical control enabling the operator to obtain quick and exact adjustment of load.

This simple but peculiarly accurate measuring instrument

was soon recognized by engine designers and manufacturers as an invaluable adjunct to engine development. The progress of engine design was marked from the start by innumerable small changes and modifications of sizes, materials, contours, etc., and each one of these changes might have an effect on the output of the engine. It was for such testing that the electric dynamometer was used in the laboratory as well is in the factory for the checking of the finished product.

Following the outbreak of the War of 1914-18, representatives of the British Royal Flying Corps opened negotiations with the Curtiss Airplane and Motor Corp., of Buffalo, for the manufacture of airplane engines and, as a result, they shipped abroad a large number of motors of the OX5 and similar sizes, 90 and 100 hp. as well as the 8-cylinder, 90-deg., V2 of approximately 200 hp. The Curtiss Company was among the first airplane engine manufacturers to use the electric dynamometer.

Modern Installations

Fig. 1 shows two of its dynamometer sets, on one of which the V2, 8 cylinder, 200 hp. equipment is shown in test. While this engine was not used extensively in any service planes, the experience gained in its design was of great value in the development of equipments of greater horsepower.

After the war the Curtiss organization developed a 12-cylinder motor which proved extremely successful and which has been noteworthy for its use in several Army and Navy planes which have won important speed contests in recent years. This work was transferred from Buffalo, some time ago, to Long Island City, where the usual electric dynamometer testing equipment was established.

Fig. 2 shows one of a number of electric dynamometers and Liberty engines in the routine of their standardized test at the Packard plant.

Prior to the development of the Liberty engine, Col. J. G. Vincent of the Packard Company had designed a 12-cylinder airplane engine, tests on which were conducted in his own laboratory by the electric dynamometer.

Other noteworthy pioneer work was carried on during the war by F. S. Duesenberg. The 16-cylinder Duesenberg engine developed by him was much larger than any previously attempted in the United States and necessitated the use of three 300 hp. dynamometers coupled in series to absorb the load.

Valuable experience was gained by similar methods at the McCook Field Dynamometer Laboratory, where were developed engines larger than the Liberty. Several electric dynamometers are used at that station.

Fig. 2. Liberty engine in test on Electric Dynamometer at the Packard Motor Car Co., Detroit

Fig. 3. Wright engine in test on Electric Dynamometer in the laboratory of the Wright Aeronautical Corp., Paterson, N. J.

In the early days of the war, arrangements were made by H. M. Crane to manufacture in this country the Hispano-Suiza engine. This engine was first built in Spain by a Swiss engineer and later taken up by the French and British. It was an extremely successful pursuit engine, and it was this equipment which made the Spad famous. Work was first undertaken in this country by the Simplex Automobile Co. (later the Wright-Martin Co. and finally the Wright Aeronautical Corp.). The latter company is now engaged in the manufacture of aircraft engines at Paterson, N. J., and a large number of its designs have grown out of the original Hispano-Suiza type. Fig. 3 shows one of the largest 8-cylinder Wright engines on the dynamometer stand. For such a test it is necessary to blow a large volume of air over the engine to simulate conditions of flight.

Dynamometers Widely Used

The electric dynamometer has been used by various government stations besides McCook Field, including the Navy Experimental Station at Annapolis, Aeronautic Division at the Washington Navy Yard, the Naval Aircraft Factory at Philadelphia, the National Advisory Committee on Aeronautics, Langley Field, and others.

Mention has already been made of the Bureau of Standards, which was among the first to undertake important development of airplane engines. This body later tested engines in its "altitude chamber" under conditions approximating those encountered by the airplane at great elevations.

It is interesting to note that a number of firms of engine builders, aviation and otherwise, in Great Britain have also adopted the electric dynamometer.

A great many other types of aviation motors were designed by various engineers in addition to those which have been mentioned and, while but few of these saw service, they all contributed to the volume of knowledge which was indispensable in carrying out our government air program.

Honorary Members of N.A.A.

The following persons have been elected to honorary membership in the National Aeronautic Association:

Wilbur Wright*	John J. Montgomery*
Orville Wright	Charles M. Manley
Miss Katherine Wright	Glenn Hammond Curtiss
Samuel Pierpont Langley*	Thomas A. Edison
Octave Chanute*	

*Deceased.

Privately Owned and Operated Air Terminals

By HOWARD F. WEHRLE

Formerly an Officer and Pilot in the Air Service U. S. Army, 1916-19

The value of the airplane as a means of transportation is rapidly proving itself and the necessity for adequate terminal facilities is becoming acute daily. As a part of the scheme of things air travel is here to stay and we should prepare ourselves to use this new method of rapid transit. It is the most comfortable, the speediest and cleanest and in time will be the most economical, especially for the long hauls in this country of ours. Those few men who took part in aviation during the world war were and still are men of vision and can see the possibilities, but older men and men of finance, although watching this "infant industry," have not, so far gone into it very thoroughly.

The possibilities of air travel are so great that the writer of these lines does not believe that any mind is today equipped to grasp it and believes that the next decade will bring about changes in transportation methods that will be cataclysmal.

Looking into the Future

Probably the greatest problem of air traffic, next to efficiency of the ships themselves, is the building and maintaining of air terminals or a system of air terminals properly equipped and offering adequate facilities for all types of aircraft whether lighter or heavier than air. Considered from a future possibility standpoint, well chosen locations for terminals will bring the owners and operators excellent returns.

It seems that the terminal problem and the terminal system will have to be solved by private enterprise, and that building up will have to be a regular normal business procedure. It is not reasonable to suppose that the government will assist commercial aeronautics by subsidy, because it is not the policy to subsidize private enterprise. Witness the disappearance of the American Merchant Marine. The experience with the railways during the fifties and sixties has made our government very cautious in the matter of subsidy. Then we might ask: Is subsidy a healthy thing for any business?

The particular terminal discussed here was brought into being as a result of a very successful aviation meet held in 1921 in a Mid-western city. Some citizens became convinced of the future possibilities of air travel and set about investigating with a view to purchasing or acquiring the use of suitable property on which to build an up to date flying field and terminal that would be available for the use of all types of ships. Five business men, who had been pilots, met and discussed the problem. The decision was made that it would be possible to go ahead with such a project along conservative business lines.

Preliminary Organization

After this quite some time was given to finding a suitable property for the purpose and when one was located that seemed to be the best for the purpose, the Post Office Department and the War Department were asked to send experienced pilots and inspectors to give opinions as to whether they thought the property suitable for use by the Air Mail and the Army (a field that is suitable for the two departments is suitable for all commercial flying). Both these agencies were intensely interested and sent very efficient men to go into the matter. Favorable opinion being given, the five organizers, after careful consideration and analysis of the various methods by which such a project might be financed, decided to form a holding company capitalized for an amount equal to the cost of the ground, and to sell the stock to a number of citizens whose public spirit would make them desirous of seeing their city take its place as leader of the nation's commercial aerial activity. It might be well to mention that, up to this point, no publicity was given as to the selection of the property and government approval thereof.

The organization of the holding company proceeded quietly and took some four months to complete. The proposition was put to prospective buyers of stock in a straightforward, sincere and concise manner, and each person approached was told that the organizers would not attempt to predict a future for aeronautics nor was the idea given out that a stockholder would eventually reap great benefits in the way of dividends. Statistical data was given on various commercial attempts in the past and a comprehensive prospectus was worked out. The holding company was finally completed and was made up of a collection of leading citizens who were enthusiastic because they considered an air terminal a good thing for the public in general and the city in particular.

It will not be necessary to go into further detail because the make up is general and the method is employed daily in organizing various lines of businesses into corporations. It is readily seen that with a good property bought at the right price the holding company would have little to fear because the property itself would be worth the amount put into it and the particular case under discussion the property has slightly increased in value. Now the organization had proceeded to the place where it had a flying field bought and paid for and ready to do business. Next was the plan of equipping and operating the air terminal.

A Field Operating Company

It was further decided by the organizers that an operating company be formed to equip the field for landing purposes and general commercial aeronautical activity, and to operate it commercially and also in conjunction with such government agencies as cared to use it (in this case the government agency was the U. S. Army Air Service). The operating company would pay a reasonable rent for the use of the ground, say a yearly rental that would be about 4 per cent on the investment of the holding company. The operating company would pay this rental for approximately a six year period, with an option to purchase the property at any time before the expiration of the lease at a price equal to the original cost of the ground plus carrying charges and the difference between the rental paid by the operating company and 6 per cent compound interest on the initial investment. On this basis, were the operating company to make a success of the project, the capital stock of the holding company would be retired at the end of, or some time during, the six year period, dollar for dollar, and would yield a net return of 6 per cent during the period. On the other hand, if the operating company should fail, the assets of the holding company would be represented by the land itself which it is reasonable to suppose would not depreciate but more likely to advance in excess of a 6 per cent annual return. In either case those who purchase stock in the holding company would be reasonably well assured of the return of every dollar put in by them.

The operating company was capitalized for a given amount (for obvious reasons exact amounts are not given) and controlled by individuals experienced in aviation, and who would conduct the project along the lines of soundest business principles. Only such equipment and facilities were installed as were absolutely necessary for the servicing of aircraft. All further improvements were to be contingent upon the success of the project. In this way the initial capitalization of the operating company could be kept low, but could be increased at any time that conditions would warrant it and expansion of the business made it necessary. Both companies were so organized and chartered that they may expand from time to time as success warrants.

Honest Salesmanship

The operating company now offered its stock to the public and in the campaign prospective purchasers were informed of the highly speculative nature of the undertaking and that the company would rise or fall with the success or failure of flying as a business possibility.

The following is a list of the things considered absolutely necessary for an operating terminal:

1. Hangars. 2. Office and headquarters building on the

field. 3. Grading, levelling and rolling the airdrome. 4. Sowing, mowing and keeping a proper sod. 5. Downtown office (Discontinued after organization was completed and moved to Flying Field.) 6. Interior roadways. 7. Fencing. 8. Telephones, water and light. 9. Organization costs. 10. Operating costs. 11. Working capital.

With regard to item 7, fencing the property was considered necessary to the success of the project for the following reasons: First, it tended to outline the flying field as a definite thing rather than a plot of ground merging into the adjoining territory. Then, it sought to create a desire on the part of those who operate aircraft to work in conjunction with the operators and carry on their activities within the environs rather than an attempt to operate on outside adjoining property. Furthermore it would tend to protect the operators from infringements of surrounding property owners and discourage inclination on their part to capitalize on the activities created by the operators, such as selling parking space for cars at advantageous places where the occupants might witness field activities free of charge. Finally, it would be instrumental in creating a desire on the part of the public to come within the limits of the field rather than gather on the outside.

Operating Costs Summarized

Regarding operating costs, these may be summed up briefly as follows: Salaries and wages of field manager and assistants, advertising, travelling expenses, rental of downtown office, rental of field, taxes and insurance, attorneys fees, incidentals.

Operating costs form an item that could be enlarged upon considerable but space will not permit.

The possible sources of income are varied and many and the choice of a man for field manager is all important. He must be ambitious, resourceful and enthusiastic, because in his hands is the success or failure of the business. Hangar rental space is a steady source of income and the prices charged are as follows:

Yearly rental for one ship	$300.00
Monthly rental for one ship	30.00
Daily rental for one ship	2.00

The last item is for periods of three days or less, over three days and up to two weeks is $1.50 per day and over two weeks $1.00 per day.

The above covers the active or producing periods for aircraft operators. From Dec. 1 to March 1 is considered a period of non-activity the rentals are $15.00 per month with an additional charge of $1.00 for each day that the ship is taken out and flown. Thus, if a ship was flown on four days during this period the rental for that month would be $19.00.

The above rentals include free use of the airdrome at any time, but pilots are required to observe the airdrome rule of the National Board of Fire Underwriters, use of electric lights for working on ships, watchman service and water.

All the above pertains to ships in flying condition. For ships stored with wings off another scale of prices prevails, because ships in this condition do not require as much space or attention. Ships completely crated are stored at a charge of 4 mills per cubic foot, the cube including the outside measurement of the case.

In addition to the above, certain pilots only desire outside tie-down space. A scale of prices is in force for these which includes necessary rope, use of the airdrome and water.

This was at first considered as a concession but it was later decided that the operators would handle this themselves (all phases of activity are gone into thoroughly and the operators decide to employ the method that will net them the most satisfactory return). This business has grown to a point where enlargement is now being seriously considered.

Repair depot and shops, air line concession, passenger carrying, flying meets and exhibitions, school concession, motor bus concession (not necessary on some fields) and lunch room and restaurant concession are all items which would require too much space to go into detail in this article, because some of them have become separate businesses.

The "Holding Company" Plan

The project has only been in operation two years, and the time is not ripe for positive statements or predictions as to its business possibilities only to the effect that the organizers have confidence in the future of commercial aeronautics and are prepared to handle the business. This has been called the "holding company plan" but is really nothing more than two corporations doing business along conservative lines, feeling their way and planning for necessary expansion to care for all traffic that develops.

The business has had all the rebuffs and setbacks that any young business usually has to contend with, and in addition many experiences that naturally come to any new line of business endeavor. Yet, it is functioning daily, paying its way and bids fair to succeed.

The Army Air Service has enjoyed the use of this property for training and keeping Reserves refreshed on flying. A rental of $1.00 per year is charged in this case. In a later article the privately owned terminal operating in conjunction with the Army will be taken up, and its chances of success and other difficulties will be gone into thoroughly.

Another Aircraft Investigation

Appointment of a committee to study the whole aircraft situation was announced on Jan. 8 last by the American Engineering Council. The chairman is Joseph W. Roe, professor of industrial engineering in New York University. The committee, it was stated by the president of the council, former Gov. James Hartness of Vermont, plans a sweeping inquiry into all phases of air navigation, particularly air mail, commercial flying and national defense.

A large group of related questions would, he said, be taken up. The economic and industrial possibilities of aircraft were described as the central problem. The most feasible air routes from an economic standpoint will be sought out, and special studies made of topographic and climatic conditions.

The report of the committee will be submitted to the American Engineering Council, the findings, it is expected, serving as a guide to future engineering policy in the field of aeronautics, which, it was pointed out, largely involves engineering problems.

Photo International

Guarding the line of retreat in Spanish Morocco—Observation plane in flight over a Spanish column evacuating a position relinquished to the Moors

AIRPORTS AND AIRWAYS

Dayton News

By Maurice C. Hutton

The first week of 1925 was the most unfortunate for Wilbur Wright Field in the history of the post. Two civilian employees were killed in an unusual collision of a speeding airplane and a truck, and the fine gymnasium, valued at nearly $50,000, was razed by fire.

Leon C. Harness, 31, assistant chief inspector, and Paul Long, 20, a chauffeur, were the accident victims. They were riding in a truck along the government road inside the post when struck by a low flying airplane going over the speed course. Both men were decapitated by the undercarriage which also tore the top off the Dodge truck. The plane continued on several hundred feet and landed with wheels practically a wreck. Lieut. E. H. Barksdale, a McCook Field test pilot, and Eugene Althoff, a civilian observer, escaped with slight injuries.

The accident occurred along the road which skirted the box seats during the National Air Races and at a point near where the judges' stand was located. The plane was a DH observation equipped with the new Loening wings. The pilot was flying at about 6 ft. to get the maximum speed at ground elevation. A board composed of Maj. J. H. Rudolph, Capt. George Kenny and Lieut. M. S. Fairchild investigated. A plan is being formulated for closing the road during use of the speed course.

The fire occurred two days later and for a while threatened the entire post. It was discovered by a guard at 3 a. m. and by daylight had completely destroyed the structure after keeping the firemen busy preventing its spreading. The fact that there were no high winds that morning is believed to have saved the airdrome.

The gymnasium consisted of two war-time hangars joined end and end, and was one of the most completely appointed in the air service. It consisted of a concrete swimming pool, bowling alleys, two handball and basket ball courts, dressing rooms for men and women, a dance floor, moving picture show and full movie projecting equipment. It was also equipped with its own heating plant. Many employees lost personal belongings in lockers. The origin had not been determined at this writing.

* * *

Brig. Gen. William Mitchell, Assistant Chief of the Army Air Service and strong advocate of an independent air force, was a visitor at McCook Field this week. He spent three days testing the planes entered in the corps observation competition, and going over new projects with Maj. J. F. Curry, commanding officer, and his staff of engineers.

During the visit General Mitchell reiterated his belief that an independent air service is the only way of developing an air power in America commensurate with the needs of the nation. "You will never have an efficient air force as long as it is tied up to the army and navy because it will always be regarded as an auxiliary to those branches," he emphasized.

Regarding future developments, he told of plans for a six or eight-hop flight from New York to Pekin, China, via Canada and Alaska, and a flight down the west coast of South America to Chile. The latter is to be started this year.

The "flying general" spent sometime in the air testing new aircraft. He flew both the Douglass and Curtiss observation jobs and pronounced them the "best two seaters that have been produced since the war." France was described by General Mitchell as being the most powerful nation, due to her air force, and Japan, second.

* * *

A ten thousand mile flight to points throughout the United States is planned by the Johnson Airplane & Supply Co. as a means of stimulating interest in commercial aeronautics, E. A. Johnson, president, announced plans on his return from an extensive trip through the west and along the Pacific coast. "We will take one or two airplanes, two pilots and a mechanic," Mr. Johnson reported. "Our itinerary has not been completed but we intend stopping at the centers of population in each district where we will give exhibitions and impress the people with the importance of establishing landing fields."

The flight is scheduled to start in May or June and will last for several months. Tentative arrangements are to use the rebuilt three-place Jenny and the Driggs-Johnson light monoplane which won the first light plane competition in America.

New Aircraft Factory at Wichita

A new aircraft manufacturing company is being formed at Wichita, Kan., by Walter Innes, Jr., son of Walter P. Innes, local dry goods merchant; Lloyd Stearman, well known aeronautical engineer; Clyde Cessna, pioneer flier of Rago, Kan., and Walter Beech, who is nationally known in commercial aviation circles. Officers and directors have not been named, but several prominent Wichita business men are understood to be giving financial support to the enterprise.

The building at 471 West First street, formerly occupied by the Cooperative Creamery, has been leased for the factory and a part of the machinery already has been installed. Operation will start in February with the manufacture of two types of airplanes, a light commercial three-seater and a heavy duty five passenger machine. A trade name for the planes has not been decided upon.

Incorporation papers have been drafted, and are in Topeka awaiting granting of a charter. The company will be capitalized at $100,000.

With the opening of the new plant, Wichita will have two airplane factories. The Swallow Airplane Manufacturing Co., of which J. M. Moellendick is president, has been one of the greatest factors in the development of commercial aviation in the Southwest, and started the spirit for progress in aeronautics which promises to establish Wichita as a center in this endeavor.

Men experienced in aviation are interested in the new project. Stearman is credited with designing the New Swallow, which performed so remarkably at the air meets held last fall. Cessna has built several planes, and was a flier when flying stood Kansans agog. Mr. Innes has been interested in aeronautics for several years, and is at present cooperating with Earl Bidwell in perfecting the "Bill" type turbine airplane motor which was described some time ago in AVIATION. Pilot W. Beech has been a Wichita flier for a number of years, piloting machines which captured high winnings in speed and efficiency races held in October of last year. A former Air Service engineer, who is credited with having designed the instruments used for night flying, also has been employed.

Investment has also been started to purchase a municipal landing field near the city and efforts are being made to obtain from the War Department authorization to establish a National Guard Air Unit at Wichita. Furthermore, with the passage of the Bill authorizing the Air Mail Service to expand beyond the trans-continental route, Wichitans hope that their new field will become a stopping place for the projected Air Mail service from Omaha, Nebr., to Houston, Tex.

Canadian Air Statistics

An official summary of Canadian civil aviation certificates and licenses in force on Dec. 31, 1924, shows that there were in Canada seven private air pilots, fifteen commercial air pilots, 190 air engineers, thirty-two registered aircraft and twenty-three licensed airports.

Spokane News

A flying circus will be staged at Spokane next summer by several of the best Army fliers in the Ninth Corps Area. Adj. Gen. Maurice Thompson announced the first part of July as the date for the exhibition, which will be part of the official dedication of the new National Guard Air Unit in Spokane. This Unit, the 116th Observation Squadron, will be equipped with nine planes. Capt. Lawrence Albert is squadron executive officer and Capt. A. E. Easterbrook is the Air Service instructor.

Three Spokane men are eligible to attend a three months' course at Brooks Field, San Antonio, next summer, to qualify as pilots. In addition the entire unit may take a flight to Rockwell Field, San Diego, for training during the summer.

* * *

"Spokane has a wonderful flying field. It's the best on this coast and averages with the best in the country."

This was the statement of Capt. A. E. Easterbrook, newly arrived Regular Army instructor for the 116th Observation Squadron, to members of the military affairs committee of the Spokane Chamber of Commerce at their weekly meeting recently.

"After an inspection of the field I find that its soil is particularly fitted to flying," Captain Easterbrook stated. "It is well drained and can be used the year around."

Propose New Air Lines

Maj. Gen. Clarence R. Edwards, U.S.A., retired; James Jackson, Massachusetts State Treasurer, who will retire within a few days, and Arthur V. Davis, President of the Aluminum Company of America and former business associate of Andrew W. Mellon, Secretary of the Treasury, are reported by the New York *Times* as the prime movers in a plan to organize a $50,000,000 corporation for the development of commercial airships, with headquarters in Boston. Boston and New York financiers are said to be interested in the scheme.

Preliminary plans, call for the building of two lighter-than-air craft at a cost exceeding $2,000,000 each. These two and others to be built will be used in transporting passengers and freight across the continent and to foreign countries, with Boston as the terminal in each case. The plans call for landing points in the Middle West as well as on the Pacific Coast.

Final plans call for a fleet of twenty or more dirigibles, each to accommodate from 100 to 500 passengers in addition to the crew, and to carry about fifty tons of freight. Engineers estimate that the trip to the coast can be made in two days or less, and allow about the same period for crossing to London.

Passenger rates are to be the same as existing train and steamship fares. Freight charges will be somewhat higher.

Amundsen Polar Plans

According to Norwegian newspapers, Capt. Roald Amundsen's flight expedition to the North Pole, which is planned for next summer, is making satisfactory headway.

In addition to Amundsen and Lieuts. Hjalmer Riiser-Larsen, Hans Dietrichsen and Oskar Omdal of the royal Norwegian navy, an American still and motion picture photographer, and two engineers have been engaged. Machines of the Dornier Wal type will be ready in February. All the necessary funds have been obtained. The organization work is in the hands of the Norwegian Aero Club.

The old plan to cross the North Pole to Alaska has been definitely abandoned. The route now proposed is only from Spitzbergen to the Pole and back again. Before the start early next summer several minor tours will be made to the north.

Another Norwegian polar explorer, Dr. Fridtjof Nansen, is also planning an aerial dash to the North Pole, and there appears to be much rivalry between the proponents of the two expeditions.

Norwegian newspapers pick Captain Amundsen as the favorite over Dr. Nansen to win the air race to the North Pole.

Lieut. Trygve Gran, who was the first to cross the North Sea by airplane and who served in the Royal British Air Force during the World War, however says that the Nansen plan to fly across the North Pole will restore to Norway its old position in Arctic explorations, as the route chosen is the only reasonable one.

"Capt. Roald Amundsen," says Gran, "has been treated in a deplorable way by his so-called friends. His new expedition is under the patronage of the Norwegian Aero Association. It is now strongly attempting to dissuade him from taking the route by way of Spitzbergen and Alaska because such a flight is hazardous. The association might have saved him many difficulties. I consider its behavior so outrageous that I telegraphed and asked that my name be dropped as an honorary member of the association."

New Aviation Field at Oklahoma City

All the pilots from Post Field, Fort Sill, Okla., attended the opening of the Oklahoma City Aviation Field on Sunday, Dec. 14. A crowd of about 25,000 people was present at the opening and witnessed the performance. They were much interested in the Martin Bomber from Kelly Field, as most of them had never seen a ship larger than a DH4.

According to *Air Service News Letter*, one thing, however, marred somewhat the feeling of fellowship and co-operation which marked the celebration. Several civilian pilots took advantage of the free gas, oil and other accommodations afforded by the Chamber of Commerce to better themselves financially by taking up passengers. They also refused to do the stunts scheduled unless a large sum of money was guaranteed. As no admission was charged, everything being free, no funds were available.

The pilots from Post Field who took part in the program were: Capt. Richard H. Ballard, Lieuts. Donald G. Stitt, Thomas L. Gilbert, John F. McBlain, Charles G. Pearcy, and Tech. Sergeant Linus D. Frederick.

Tourabouts Operate in Honduras

On Dec. 27 the Lincoln Standard Aircraft Corp. of Lincoln, Neb., shipped to the United Fruit Co. of Tela, Honduras, two Lincoln Standard Tourabouts, making the fourth plane delivered to the Fruit Company during the past year and the fifth to go to Honduras. G. V. Pickup of Washington, D. C., represented the Fruit Co. in the purchase of the planes and is now in charge of their operation.

These planes are used chiefly for the purpose of transporting officials of the United Fruit Company from Tela, which is located on the Coast, to Tegucigalpa, 140 mi. in the interior. This route is flown in one hour and forty minutes to two hours, and by any other possible means of travel available in that country it takes in the neighborhood of five days to make the same trip.

Penna. R. R. Roof as an Airport ?

The possibility of creating a commercial airport in New York by roofing over the yards of the Pennsylvania Railroad at Thirty-third Street and Ninth Avenue and by putting flat roofs on large piers on the waterfront was considered by the Select Committee of Congressmen which held hearings last week on the operations of the Air Services in the United States.

The committee is headed by Congressman Florian Lampert of Wisconsin and met at the Waldorf-Astoria. It is probable that the committee will recommend to Congress the establishment of a permanent commission of engineers empowered to lay out flying routes, landing fields and to govern the marking and lighting of fields and routes.

Air Mail Extensions on West Coast

Extension of the transcontinental Air Mail service to give direct delivery to Los Angeles and the Northwest, in addition to San Francisco, was promised by Col. Paul Henderson, Second Assistant Postmaster General, on his recent arrival in San Francisco. Colonel Henderson said, however, that funds were not yet available for these extensions, which will branch off the main mail airway from Salt Lake to Los Angeles, and from Elko, Nev., to Pasco, Wash., and other cities of the Northwest.

UNITED STATES AIR FORCES

U. S. ARMY AIR SERVICE

General Patrick Visits Langley Field

Maj. Gen. Mason M. Patrick, Chief of Air Service, was a visitor at Langley Field, Hampton, Va., on Dec. 15 and 16. The General came down from Washington by boat and landed at the Naval Base near Norfolk. A flight of five planes was dispatched from the field to escort the General to the field. On the evening of the 15th a dance was given at the Officers' Club in his honor, and it was attended by all officers and ladies of the Post as well as several officers from Fortress Monroe.

Smoke Screen Experiments at Fort Benning, Ga.

Staff Sergeant L. P. Hudson with Corp. J. F. Zombro as passenger, both stationed at Phillips Field, Aberdeen Proving Grounds, Md., recently flew in an NBS1 smoke screen ship to Fort Benning, Ga., to lay a series of smoke screen in connection with the Chemical Warfare Service. Five screens were laid, all being very successful. On the return trip to Phillips Field stops were made at Savannah, Ga., Pope Field, N. C., and Bolling Field, D. C.

Big Air Maneuvers in Philippines

The most extensive air maneuvers ever held in the Philippines were scheduled to be held from Jan. 21 on for ten days. Twenty-five planes from various army posts will fly to the Island of Mindoro, where a base will be made. From Mindoro army maneuvers will be carried on to the various islands, a feature being an air "attack" upon the transport Thomas when the vessel passes through Verde Channel.

U. S. NAVAL AVIATION

Los Angeles over New York

The U. S. naval airship Los Angeles made an unexpected call over New York City on Jan. 9. The flight over the city was one of several the ship took during a thirty-three-hour test in which she was repeatedly moored at the mast.

With a crew of forty-two aboard, including eight of the German staff that brought the ship overseas, the Los Angeles left Lakehurst at 9 o'clock in charge of Comdr. J. H. Klein, Jr. to give the crew practice in handling the airship.

She flew over the Battery at 12.40 p. m. and floated northward, skirting Manhattan Island over the Hudson. She soon veered over Hudson County, N. J., and made a semi-circle, carrying her over Princeton and other towns. The ship arrived back at the Lakehurst station at 3.30 p. m.

Commander Klein and other officers expressed themselves as satisfied in every way by the test trip. The only mechanical difficulty was the freezing of three water lines. a minor detail.

Memorial Trophy for Safe Flying

A Memorial Trophy, in memory of the late Lieut. (jg) Herbert Schiff, U.S.N.R.F., has been presented to the Navy Department by the members of his family. Lieut. Schiff was a Naval Reserve Aviator, killed in line of duty at the Naval Air Station at Hampton Roads, Va. on July 11, 1924. At the time of his death he was undergoing a special two week's active training period, stationed at the Naval Air Station, Anacostia, D.C.

He first entered the Naval Reserve Force during the World War, in September, 1917, and after receiving training at the Naval Air Station, Pensacola, Fla. was designated a Naval Aviator and commissioned as an Ensign. He was assigned to duty at the Naval Air Station, Chatham, Mass. from September 1918 until January 1919, when he was released from active duty. He received his commission as Lieutenant, junior grade, in the Reserve Force in April, 1919. Lieutenant Schiff took a two weeks active training course at different Naval Air Stations and Air Squadrons on the Atlantic Coast each year since 1919.

Lieutenant Schiff was 29 years old at the time of his death, having been born in November, 1894 at Harrison, N. J. At the time of his death he was a junior member of a firm of New York insurance brokers.

A Committee, known as the Herbert Schiff Memorial Committee was formed, the membership including William Schiff, brother of Lieutenant Schiff, and Rear Admiral W. A. Moffett, Chief of the Bureau of Aeronautics, Navy Department. The following details concerning the purpose and conditions for the annual contest for the Memorial Trophy are quoted from the letter of the Committee to the Secretary of the Navy:

"The family feels that such a trophy will perpetuate the memory of the spirit of their son, and his untimely end in line of duty; and will serve to stimulate interest in Naval flying and in the reduction of aviation accidents.

"The family, knowing the spirit that acuated their son, offer the Herbert Schiff Memorial Trophy, to be competed for each year by the Naval Aviators of the Service—the award to be made to that Naval Aviator who, flying either as the commanding officer of an aircraft or as pilot of an aircraft, compiles the highest number of flying hours per annum, without serious accident to personnel or material. The first competitive year will be July 1, 1924, to June 30, 1925.

"Should the further development of Naval Aviation be such as to render this qualification for the award of the trophy of little practical value or interest, it is requested that the Chief of the Bureau of Aeronautics formulate new rules for such new form of competition as he may deem adequate and fitting."

The aviator winning the contest each year will have his name inscribed on the original trophy and he will then be given, for his own possession, a replica of the original trophy. The plan is to have the original trophy on display in the Navy Department.

In accepting the Trophy, Secretary Wilbur wrote to the Committee: "It gives me great pleasure to approve your recommendation concerning the Schiff Memorial Trophy. I think it is an excellent plan, for it will not only tend to add to the morale of the service, but is a fitting tribute to a young man who gave his life to the service after having served so faithfully and loyally."

The high spirit of patriotism and interest in the Service of their son reflects the greatest honor on his family. Far from being daunted or embittered by his untimely death, their desire has been to safeguard the lives of others performing the same duties and to perpetuate the memory of their son throughout the Naval Air Service by means of this Trophy.

Naval Air Orders

Lt. Comdr. Harold W. Boynton, det. Naval Air Station, N.O.B., Hampton Rds., Va.; to aide on staff, Comdr. Setg. Flt.

Lt. (jg) William L. Hickey, det. U.S.S. Patoka; to temp. duty under instr. in chemical warfare, Edgewood, Md.

Lt. (jg) Harold J. McNulty, det. Aircraft Squadrons, Setg. Flt.; to Naval Air Station, Pearl Harbor, T. H.

Lieut. John C. Williams, det. Naval Air Station, N.O.B., Hampton Roads, Va.; to Aircraft Squadrons, Scouting Fleet, involving flying.

Ens. John Connor, ors. 13 Dec. 1924 revoked. Det. U.S.S. Raleigh; to temp. duty under instr. in aviation, Naval Air Sta., Pensacola, Fla.

Lt. (jg) Myron F. Eddy, det. Naval Air Sta., Pensacola, Fla.; to Aircraft Squadrons, Setg. Flt. involving flying.

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U. S. NAVAL AVIATION

(Continued)

Lt. (jg) John M. Hoskins, det. U.S.S. Maury; to temp duty under instr. in aviation, Naval Air Sta., Pensacola, Fla.

Lt. (jg) Joseph C. Van Cleve, det. Edgewood Arsenal, Edgewood, Md.; to temp. duty under instr. in aviation, Naval Air Station, Pensacola, Fla.

Ens. Edgar A. Cruise, det. U.S.S. West Virginia; to temp. duty under instr. in aviation, Naval Air Station, Pensacola, Fla.

Ens. Roy R. Darron, det. Div. 35, Dest. Sqd., Battle Flt.; to temp. duty Naval Air Station, Pensacola, Fla.

Ens. Thomas H. Ochiltree, det. U.S.S. California; to temp. duty under instr. in aviation, Naval Air Station, Pensacola, Fla.

Lieut. Ralph H. Norris, det. Nav. Air Sta., Pensacola, to Asiatic Sta.

Lieut. (jg) Campbell Keane, det. Nav. Air Sta., Pensacola, to Asiatic Sta.

Lieut. (jg) John L. Murphy, det. Nav. Air Sta., Pensacola, to Asiatic Sta.

Publisher's News Letter

A jeweler generally avoids wearing what he sells; a candy maker is not apt to eat his product. In the same way most publishers who give publicity to others avoid emphasizing their own personalities in their papers. For the first time since AVIATION has been published the temptation is too great to escape.

Probably many readers may think that the picture in this column with its fierce, determined and forceful appearance is that of the writer of this page and that the aenemic, vacuous and timid person pictured in the next column is the popular conception of a Congressman. But the reverse is the case. The gentleman caricatured in this column is none other than Hon. Florian Lampert of the Special Aircraft Investigating Committee and the Raphael Cherub in the next column is what Artist Major of the N. Y. *American* thought we looked like at the hearing of the Committee held in New York. It is one of the delights of publishing to see ourselves as others see us.

* * * *

It is unfortunate that the size of AVIATION does not permit it to print many of the stories that it should give to its readers. But until the aircraft industry enlarges its advertising budget and gives the support that foreign constructors give their trade press, many important matters will have to go unheralded. A case in point is the account of the work of the Lampert Committee that has been holding hearings almost daily since Dec. 1. The hopeless task of giving any adequate interpretation of the ground covered by these Congressmen can be indicated by the fact that by Dec. 22, over four hundred printed pages of testimony had been taken. Since that time an equal volume of information has been spread on the record. It would take many pages to even summarize the proceedings, which, however, give a very interesting picture of the present status of aviation in this country. The conclusions of the Committee with its recommendations will, of course, be discussed fully.

* * * *

There are many other events and occurrences that we would like to "cover" but it would require twice the space we have at our disposal to do so. A word or two may be said here about the personnel of the Lampert Committee. Mr. Lampert of Wisconsin has yielded the chair at most of the hearings to Hon. Randolph Perkins of New Jersey, who has conducted the hearing with dignity, tact and intelligence. Usually his examination of witnesses is followed by further questioning by the Hon. Anning S. Prall of New York and Hon. Clarence F. Lea of California, both of whom show a commendable interest in bringing out clearly the witnesses' viewpoint. Then the "Peck's Bad Boy" of the Committee usually gives the witness a caustic cross examination. Hon. Frank R. Reid, of Illinois, is the nearest approach to the type of prairie district attorney that could be imagined. His cross examinations have brought out the two high spots in the investigation so far. The first is the cost of aviation since the War, 433 million dollars. The second was that General Patrick could not recall a single achievement of McCook Field; Grover Loening could only name the "wobble pump" and Charles Lawrance brought up the "saltpetre valve." Mr. Reid used this information as might be expected from a merciless cross examiner. His wit and humorous asides save him from being taken too seriously.

* * * *

What the conclusions of the Committee will be can be foreseen in a general way from the questions asked those who appear before it. They will probably urge some unification of our aviation; they will emphasize the need of encouraging commercial aviation by the government; they will probably recommend an engineering committee to report on the best way to bring this to a realization. They may make recommendations regarding McCook Field and the Naval Aircraft Factory. Probably the report as finally published will serve as a compendium of information that will be the most complete that has yet been available.—L.D.G.

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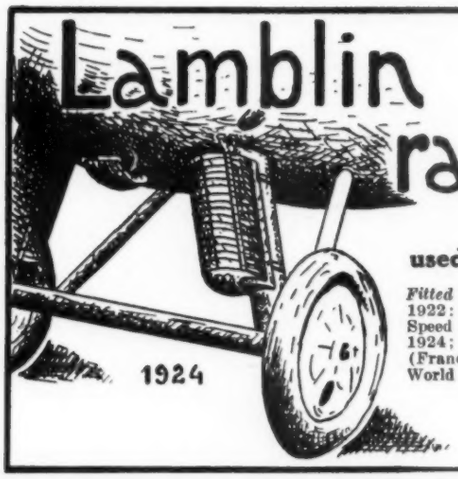

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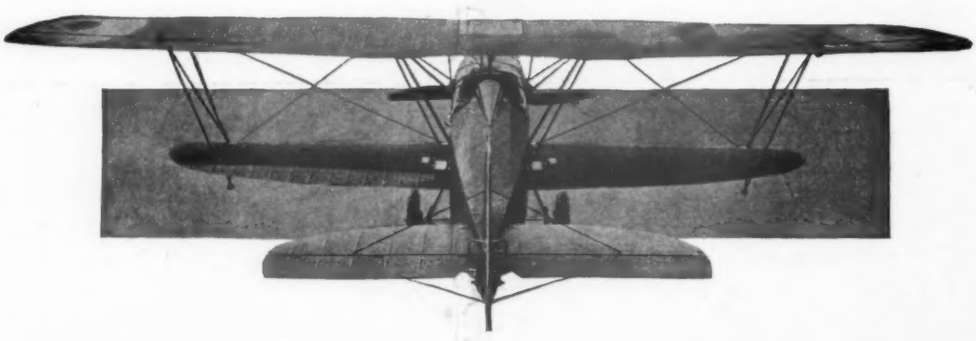
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